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A SURVEY

OF

COLORADO HEALTH PROBLEMS AND FACILITIES

BY

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COLORADO STATE BOARD OF HEALTH

1940

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With suggestions for future programs

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FOREWORD

The author's frequent need for information on Colorado health facilities has lead to the preparation of the publication here presented. The statistical material was collected from many sources, none of which offered a public health interpretation.

In the interpretations and conclusions the author has been advised and assisted by many fellow workers in the field of public health. He wishes to express his appreciation to the faculty members of the Department of Public Health of Yale University, School of Medicine, for their counsel in the planning and preparation of this dissertation; particularly to Mr. M. A. Pond for his criticism of structure and minor errors, to Dr. J. W. Watkins for his aid in statistical analysis, to Dr. Franz Goldman for advice on hospitals and physicians, and Professors Ira V. Hiscock, and C. E-A. Winslow whose inspiring lectures, seminars and conferences are responsible for many of the conclusions and recommendations expressed.

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CHAPTER I

INTRODUCTION

Among the important duties of government are those which relate to the health and welfare of the population living in the community. Democratic governments have always tried, however ineffectually, to provide safeguards against the rampant spread of communicable diseases. In the American colonies one of the earliest concerns of the settlers was the preservation of health. They soon learned that epidemics followed migration, and filth contributed to ill health, and their early laws provided for quarantine and environmental sanitation.

The first state program of public health work began in Massachusetts with the establishment of a state board of health in 1869. The functions of this board were to "take cognizance of the interests of health and life among the citizens of the Commonwealth. They shall make sanitary investigations and inquiries in respect to the people, the causes of disease, and especially of epidemics and the sources of mortality and the effects of localities, employments, conditions and circumstances, on the public health; and they shall gather such information in respect to those matters as they may deem proper, for diffusion among the people." (1)

Following the lead taken by Massachusetts the other states formed state health organizations and by the close of the century 38 states had assumed similar functions for the protection of the health of their citizens. The last state health organization was established in New Mexico in 1919.

Federal interests in public health began in 1798 with the establishment of the Marine Hospital Service. By an act of 1878 this body was authorized to impose quarantine to prevent entry of disease into the United States from abroad, and in 1893 this authority was extended and provision was made for cooperation with state and local agencies (2). In 1912 the name of this agency was changed to the United States Public Health Service.

The first financial aid to state and local health departments from federal funds came through an appropriation by Congress in 1917, for $25,000 to be administered through the United States Public Health Service. Comparable amounts were appropriated annually by Congress until 1935 when the Social Security Act was enacted.

During the World War, United States Army officials became concerned with the high prevalence of venereal disease among the enlisted men of the army. Their action, supported by the American Social Hygiene Association (3) led to the adoption by Congress of the Chamberlain-Kahn bill (1919), creating the United States Interdepartmental Social Hygiene

Board. Recommendations of this board resulted in an amendment (1921) to the original bill, for federal aid to states cooperating with the plans of the federal board.

Concern for the health and welfare of mothers and children, by official and nonofficial agencies of the United States, led to the passage by Congress of the Sheppard-Towner Act (4) (1921). The Act provided for the creation of a Board of Maternity and Infant Hygiene to correlate the work of the United States Children's Bureau, United States Public Health Service, and the United States Bureau of Education, and to allot grants-in-aid to states cooperating with plans of the federal board.

The Social Security Act evolved from the findings of the White House Conference on Child Health and Protection (1929), the Committee on the Costs of Medical Care (1932) and the National Health Inventory (1935-1936). A study of the findings of these committees demonstrated a lack of adequate and systematic control of public health functions of many local governments, an uneven distribution of services, a small portion of the tax dollar devoted to public health, and a deficiency of properly trained personnel to carry on such work.

The Social Security Act (1935) under Title V appropriated $3,800,000 for maternal and child health and $4,000,000 for crippled children, to be distributed through the Children's Bureau and under Title VI appropriated $8,000,000 for local public health work to be distributed through the United States Public Health Service. These appropriations were to be distributed among the states on the basis of population, financial needs, and special problems. In May 1938 Congress appropriated $3,000,000 to be distributed to the states through the United States Public Health Service for investigation, control, and treatment of venereal disease. This legislation was based on recommendations of the Conference of State and Territorial Health Officers, The American Social Hygiene Association and many other cooperating organizations. The method of distribution was essentially the same as that used for Social Security funds.

Following the July 1938 meeting of The Interdepartmental Committee to Coordinate Health and Welfare Activities, recommendations were made to Congress for substantial increases in federal appropriations for health and welfare activities in local governments. The committee recommendations have been incorporated in Senate Bill 1620 now (1939) being considered by Congress. This bill provides grants-in-aid to states for: maternal and child health services, medical services for children and services for crippled and other handicapped children, public health work and investigations, hospitals and health centers, medical care, and temporary disability compensation.

In discussing the state of the nation's health at the National Health Conference in 1938, Josephine Roche stated:

"The existence of long standing and insistant needs of our people for more adequate health services and medical care has been recognized by every one who has spoken." (5) Discussions at the conference revealed that the largest population replacement reservoirs in the United States are those areas where economic conditions are poorest. Here also, morbidity and mortality rates are among the highest in the country. This part of the population receives about 30 per-cent of the needed medical attention, and few of the mothers receive either adequate prenatal or obstetrical care.

The Technical Committee on Medical Care reported that a small part of the population of the United States is supplied with full time, competent, and well trained health officers with a professional point of view. About half the state health departments are not adequately staffed nor satisfactorily equipped to render services expected of them, and less than a third of the counties and cities of the United States employ full time professional health officers.

Specific plans of the committee envisioned the eradication of tuberculosis, venereal disease, malaria, and certain occupational diseases, the lowering of mortality from pneumonia and cancer, the reduction of morbidity in the care of mental disorders, and the improvement of maternal and infant hygiene.

Discussions on maternal and child health showed high puerperal and infant mortality rates throughout the United States, and the committee recommended national planning for the provision of adequate medical and nursing care and hospital facilities for all prenatal and obstetrical cases.

That health is a purchasable commodity and that many of the nation's ills can be prevented by well conducted public health programs has been shown by many of the outstanding public health leaders of the nation. Winslow (6) has reminded us that,

"We need economy in government as we need it in the conduct of our individual lives; but economy is not synonymous with senseless panic of budget slashing.... It does not mean refusing to spend money.... Economy means spending money wisely." Tax money in proper amounts wisely invested in public health procedure will return its value to the community many times over.

In measuring the monetary value of health work, Dublin (7) states that one of the large insurance companies of the United States estimates that public health work conducted among its policy holders has

effected savings in claim payments representing twice the sum expended for this service. He also points out, for example, that the estimated money value lost through sickness and death from typhoid fever in Pittsburgh in the period 1904-1907, if applied to the construction of water plants and filter beds, would have sufficed to cover the entire existing installations for the Pittsburgh district in 1930.

With many research activities in preventive medicine, the administrative studies of the Children's Bureau and the United States Public Health Service, and the splendid work of our many foundations and voluntary health agencies, the horizon of public health activities is rapidly growing to unpredictable limits. With all of our resources and knowledge of public health we have failed to make these advantages available to a great part of our population.

If, in this widening program of public health work, we wish to make public health services available equally to all residents of a community it is necessary to establish local administrative units with personnel capable of studying the assets, characteristics, and problems of that community and planning programs to fit its needs.

With this in mind the following chapters will be devoted to a study of the assets, characteristics, and problems of the state of Colorado and an applicable plan of local health administration that will bring the advantages of modern public health knowledge to every resident of the state.

CHAPTER II

GENERAL DESCRIPTION

EARLY HISTORY

The thousands of unexplored cliff houses of southwestern Colorado have yet to reveal the reason for the disappearance of the inhabitants whose culture antedates the Christian Era and who are the oldest race known to have lived there. At present this part of the state offers poor agricultural facilities, poor game refuges, and suffers from lack of water, yet 3,000 years ago it supported a race of people with a highly developed community culture.

The first white man known to have visited this part of the state was Coronado (1540) who describes the inhabitants as nomadic Indian tribes. He described the communal life of the Pueblo Indians whose buildings, a few miles south of what is now the Colorado-New Mexico state line, are at present in a good state of preservation.

Six Indian tribes, the Utes, Algonkians, Siouans, Kiowans, Arapahoes, and Cheyennes made their homes in the area which makes up the state of Colorado. Of these only the Utes remained on the western side of the Continental Divide, and now are the only tribe still remaining in the state.

The Indians of the eastern plains built their culture around the buffalo. They made use of the hide, flesh, fat, sinew, and hair to provide them with food, clothing, shelter, and instruments. All of these tribes were nomadic, following the changing seasons from Canada to Texas. There is little wonder that they resented the intrusions of the white men who slaughtered their buffaloes, fenced their lands, and introduced smallpox and measles that killed great numbers of their tribes.

After Coronado's explorations the Spanish established missions in the present state of New Mexico but it is doubted that they returned to Colorado until Governor Valverde led an expedition into the Arkansas valley in 1719 for the purpose of punishing Indian offenders. He returned with stories of the French pushing their trading west from the Mississippi and threatening the Spanish supremacy of the west. These stories stimulated Spanish explorations and in 1765 Rivera is known to have explored the San Juan and Gunnison valleys in search of silver. Within the next few years several Spanish groups, whose names still mark the country, visited the western slope. By the close of the 18th century the Spanish explorers were familiar with all the river valleys of western Colorado.

The state is made up of portions of the Louisiana Purchase (1803), the Mexican Purchase (1845), and the Northwest Territory. The first United States' exploration of the territory was made in 1806 by Lieutenant Zebulon Pike who arrived at the present site of Pueblo on November 23rd of that year. With three of his men he explored the Fountain river to the present site of the City of Colorado Springs where he climbed Cheyenne Mountain and saw the majestic snow capped peak that bears his name. He continued his explorations up the Arkansas river valley, passed through the Royal Gorge, and turned south into the San Luis valley where he established a fort on the site of the present city of Alamosa which he later learned was in territory owned by Mexico.

By the Treaty of 1819 the boundaries of the United States were definitely determined and Mexico, now a free country, became owner of the south quarter and the west half of Colorado. This land was acquired by the United States by purchase from Mexico in 1848.

The first commercial enterprises were trapping and fur trading, beginning about 1821. Trappers and traders established the first inhabited settlement of the state on the present site of Pueblo about 1822. By 1840 fur trading posts were established throughout the state but within the next ten years fur had declined and the territory was considered remote and uninviting to settlers.

In 1858 gold was discovered in the South Platte river. When news reached the East there was a rush of men to the new gold fields, their numbers being estimated at 100,000. Many new towns were established and fortunes were made overnight, not only in gold but in real estate and trading. The newcomers found gold but many were not able to mine it because of inexperience. This, along with high freight rates brought a slump in mining, and many idle camps. The territorial census of 1866 was reported as 28,000. By the end of the 60's mining was established on a sound basis and the agricultural possibilities of the territory were discovered. The railroad was extended to Denver and the land grant railroads developed agriculture. Agricultural colony methods were used to form many new towns. From 1870 to 1876 the territory grew from 40,000 to 100,000. In 1876, just one hundred years after the Declaration of Independence, Colorado was admitted to statehood.

PHYSICAL CHARACTERISTICS

Colorado lies in the center of that portion of the United States west of the Mississippi basin and on the east central edge of the Rocky Mountain region. It is bounded on the west by Utah, and on the north by Wyoming and Nebraska, and on the east by Nebraska and Kansas, on the south by Oklahoma and New Mexico, and the southwest corner touches the northeast corner of Arizona. The outline of the state, which is the 7th largest of

the United States, is a rectangle with an area of 103,658 square miles of which 290 square miles are water surface. The area of the state is about twelve times the area of Massachusetts, or equal to the area of Ohio, New York, Connecticut, and Vermont combined.

The state contains the highest portion of the Rocky Mountains in the United States, with 49 peaks rising more than 14,000 feet above sea level. It also has the highest mean altitude of any of the United States, with only one fourth of its area below 5,000 feet and the lowest point in the state 3,385 feet above sea level.

The state is divided through the center from north to south by the Continental Divide (see Figure I), so called because the drainage from its eastern slope flows into the Atlantic Ocean while the western slope is a Pacific water shed.

The eastern slope levels off into a broken, flat prairie crossed in the north by the basin of the Platte river, and in the south by the basin of the Arkansas river. In the southwestern portion of the eastern slope the head waters of the Rio Grande del Norte river flow southward across the San Luis valley into New Mexico.

The western slope is composed entirely of rough mountain areas, narrow fertile valleys, high mesas, and lofty rugged peaks. The northern part is crossed by the White and Yampa rivers, the central portion is drained by the Colorado river, and in the south the tributaries of the San Juan river flow southward into New Mexico.

The source of Colorado streams is mainly the melting snow in the high mountain ranges providing a steady year around flow used to irrigate the arid, fertile, agricultural areas. Flowing wells and hot and cold springs add to the abundant water supply, one of the springs near Pagosa Springs having an average flow of 700 gallons per minute. The value of Colorado's water supply is shown in the 1930 census which reports 52.2 per-cent of the farms depending on irrigation.

CLIMATE

Colorado is well known for its delightful climate and many people enter it every year in quest of better health. The feeling one has of greater capacity for work is due to lessened atmospheric pressure which is accompanied by deeper breathing, in an effort to inhale the same amount of oxygen. Those who come to the state hoping to improve lung diseases may be disappointed because increased lung activity is thought by some authorities to aggravate such conditions. Rest is probably as great a factor in arresting lung disease in Colorado as it would be at a lower altitude. It is well known that available moisture is an important factor in the growth of bacteria, and in this respect, Colorado

climate is kind to the hosts of harmful bacteria. From personal observation in medical practice, human infections appear to be more rare in Colorado than in the middle west. Putrefaction of organic material is much slower. The concentration of the actinic rays of the sun is higher here than in most of the United Stated because of the clear, dust free atmosphere.

Because of the large area of the state and its varying altitudes it is difficult to describe temperature variations in a general statement. The predominant factor is altitude, the average temperature varying inversely with altitude. From weather bureau observations for the past 45 years the mean temperature is recorded as 44.9 degrees, with the highest temperature observed in 1888 as 115 degrees with the lowest temperature observed in 1913 and 1930 as 54 degrees below zero. The highest and lowest mean temperatures are reported from observations at the highest and lowest altitudes. The lowest mean temperature of 32 degrees is reported from Fraser (elevation 8671 feet), in Grand County. while the highest mean temperature of 54.4 degrees comes from Lamar (elevation 3500 feet), in Prowers County.

The mean annual precipitation on the state as a whole during 46 years has been 16.62 inches. This varies widely in the different parts of the state from a low of 6.81 inches at Manassa in Conejos County to a high of 26.69 inches at Silverton in San Juan County. In Denver, precipitation of one inch in 24 hours is probable twice a year, while at Grand Junction, in Mesa County, a one inch rainfall is probable once in two years. Snowfall in the mountains is more important to agriculture than rain. The summer melting of the hugh snow banks is the main source of water for irrigation and domestic use. Little snow falls on the eastern plains or in the low valleys but in many of the high mountains snow covers the ground the year around. At Denver there is measurable snow on the ground on an average of 54 days in the year, while Grand Junction averages 32 snow days per year. The lightest average annual snow fall in the state is recorded as 11.1 inches in Utleyville in Las Animas County and the heaviest as 463.1 inches at Ruby in Gunnison County.

Authoritative studies indicate that relative humidity has an important effect on the sensitiveness of the human body to temperature. Colorado is fortunate in this respect in having low relative humidity. The bitter cold of near zero weather found in high humidity areas is never experienced in the state. The relative humidity at noon in Denver from 15 years observations averages 39 per-cent. The same observations in other United States cities show relative humidities as: Albany 62 per-cent, Buffalo 73 per-cent, Chicago 63 per-cent, Kansas City 56 per-cent, New Haven 70 per-cent, Seattle 70 per-cent.

The growing seasons in the state measured between killing frosts, vary considerably, the longest is 186 days, while the shortest is 76 days.

FIGURE I

The "Front Range" of the Rockies running down the middle of the state from north to south rises abruptly, cutting the state in two. From this mountain barrier, level prairies stretch eastward into Kansas, broken only by a few shallow streams. To the west the Rockies continue across the border into Utah. Note the famous "Four Corners" in the Southwest, where Colorado, Utah, Arizona, and New Mexico meet at right angles.

From Compton's Pictured Encyclopedia, courtesy of F.E. Compton and Company, Chicago, Ill.

In the high altitudes where short growing seasons would make agriculture seem impossible, crops of potatoes, lettuce, and small grains mature under clear, cloudless skies in remarkably short periods.

RAILROADS

Railroad construction in Colorado is expensive and involves many different engineering problems with the result that facilities are inadequate in the mountain districts. Six railroads extend from the foothills of the mountains eastward across the plains, but westward only one railroad crosses the Rockies and reaches the west border of the state. Only one railroad route crosses the state from the north to the south border, along the eastern foothills of the mountains.

Railroad travel through the mountains is slow because of torturous routes with steep grades and sharp curves. Wide use has been made of narrow gauge railroads in the mountains to carry the supplies and products of the mining industry, but in the past few years many mines have closed and the miners have migrated to other sections. Many miles of mountain narrow gauge track have been abandoned recently and those few surviving roads are now operating with light trains and in many places on weekly schedules.

Improvement in automobile roads and truck competition on freight hauling has already doomed several lines and discouraged any plans of future rail developments within Colorado.

HIGHWAYS

Federal, state, and county funds are used to maintain Colorado highways. In 1939 the state highway system included 12,210 miles of highway of which 3,694 miles are on the Federal-Aid system. In addition to this mileage there are about 50,000 miles of county roads of lesser importance.

Within the state there are 14 National Forests and 7 National Parks covering 21,835 square miles. Roads in and adjacent to these areas are maintained by the Federal Government and 25 per-cent of the forest revenues are allotted to the highway funds of the counties lying within their borders. In 1935, 42 counties received such allotments ranging from $108.07 to $5,848.42.

Highways maintained by the state in the eastern plains area are generally of concrete construction, while in the western mountain areas asphalt construction is used because of the extreme temperatures to which they are subjected. At present (1939), 539 miles of the 4,060 miles of state maintained, hard surfaced roads are of concrete construction.

The construction cost of a two lane highway in the eastern plains area varies from $7,000 to $13,000 per mile, while in the western mountain area the cost varies from $35,000 to $215,000 per mile because of the difficult engineering problems and heavy rock work.

The average cost of maintenance of Federal-Aid highways for the entire state in 1938 was $336.39 per mile, being about $200 per mile on the eastern plains and about $450 per mile in the western mountains. Heavy snow in the mountain areas from November 1st to May 1st adds to the cost of highway maintenance. Usual snow fall on the mountain passes will run from 200 to 300 inches total for the year. In 1937, on Wolf Creek pass, the snow fall in six months totaled 74 feet. Snow clearance of the highways costs about $150,000 annually and the state has $200,000 invested in snow removal machinery.

Of the 27 passes on the state highway system, 10 are usually closed a part of the winter. With the exception of a few stormy days, all passes on the main highways are kept open throughout the winter.

Only one state highway crosses the state from north to south, running along the edge of the eastern foothills of the Continental Divide. This highway (U.S.85) passes through Greeley, Denver, Colorado Springs, Pueblo, and Trinidad, connecting all of the heaviest populated areas of the state and crossing all the east-west highways.

Five state maintained roads (U.S. Route Nos. 6,24,40,50,160) cross the state from east to west, each following the course of one of the river systems.

Highway No. 6 enters the state along the Platte river, following it to its head waters, crosses Fremont pass into the upper reaches of the Arkansas river, over Tennessee pass into the valley of the Colorado river which it follows into Utah.

Highway 24 enters the state along the southern edge of the Platte river valley and in El Paso County enters the Arkansas valley which it follows to Tennessee pass and into the Colorado river valley.

Highway No. 40 enters the state on the northern edge of the Arkansas valley, runs northwest to cross into the Platte river valley which it follows to Berthoud pass, crossing into the Colorado valley through the upper reaches of it into the Yampa river valley and west into Utah.

Highway No. 50 enters Colorado along the Arkansas river, follows it to Monarch pass where it enters the Colorado river head waters to follow this river into Utah.

Highway No. 160 begins in Colorado at Walsenburg on highway No. 85 and passes westward into Utah passing through the upper reaches of the San Juan river throughout its course along the southern border of the state.

Many hairpin curves and steep grades on the highways make automobile travel slow in western Colorado. Air line distances on a map may be quite misleading because highways are more often built in the river valleys around the mountains rather than directly over them. As an example of this variation the following comparative air line and road mileages are cited:

	Air Line	Road
Ouray to Telluride	4 miles	51 miles
Ouray to Lake City	10 miles	115 miles
Creede to Silverton	18 miles	82 miles
Montrose to Norwood	15 miles	70 miles

GOVERNMENT

The constitution of the state as adopted in 1876, retained its original form and served its purpose well until 1915 when the legislature established a committee to survey the business methods of the state. The report of this committee led to the adoption of a budget system in 1919. In 1922, Governor-elect William E. Sweet with several members of the staff of the New York Bureau of Municipal Research Administration made a study of the state government organization and proposed a plan of consolidation into nine administrative departments. The legislature defeated this proposal but in 1933 adopted an administrative code under which the state now functions.

The present state government is described by Buck (8) as follows:

"The administrative code abolished some twenty-five boards and commissions and consolidated their functions into six departments. Six elective constitutional officials are made heads of these departments, namely, the governor, head of the executive department; the state treasurer, head of the department of finance and taxation; the state auditor, head of the department of auditing; the attorney general, head of the department of law; the secretary of state, head of the department of state; and the superintendent of public instruction, head of the department of education. The heads of these departments, with the exception of the superintendent of public instruction, constitute the executive council. This council has authority to pass on the governor's budget, review all purchases, establish a uniform system of accounting for all agencies, departments, and institutions, and approve their budgets and

work programs. Fiscal control practically rests in the hands of this body. Directly under its supervision are three divisions: budgets, accounts and control, and purchases.

"The executive department is large, consisting of about a dozen divisions and agencies, which perform the major part of the administrative work of the state government. The principal divisions are agriculture, conservation, public welfare, industrial relations, public health, highways, and water resources. These divisions are in effect departments operating under the direction of the governor. The governor, therefore, has the major responsibility for administration, the other elective officials, or so-called department heads, having in the aggregate fewer functions than has the governor. Nevertheless, the form of government, although admittedly in a transitional stage, is quite similar to the commission form of government in cities, tending to dissipate rather than to concentrate executive responsibility."

The budget commissioner and purchasing agent act as confidential advisors to the governor and their acts are reviewed by the executive council. The budget commissioner compiles budgets for all departments, based on their estimated needs. The budgets are passed by the executive council and presented to the legislature by the governor with suggestions for appropriations and revenues.

The administrative code of 1933 has given a freedom of administration to each of the separate departments and has concentrated fiscal control in the executive council.

The county is used as the unit of local government administration. It is governed by a board of county commissioners consisting of three members, one elected each year by popular vote, for a three year term. Within the county there may be incorporated towns or cities operating under independent administrations. Eleven cities have elected to come under the provisions of the home-rule amendment of the state constitution, which grants them the privilege of enacting laws more stringent than those of the state.

PUBLIC HEALTH ADMINISTRATION

The public health functions of the state are administered through a board of nine members, three of whom are appointed every two years, by the governor. The qualifications specified for board members are that they be citizens and voters in the state. Every two years the board elects a president and secretary from its membership and the secretary becomes the executive officer, except when the board is in session.

Through 1934 the state board of health operated as a skeleton organization, but since 1935, stimulated by federal funds and larger appropriations by the state legislature, full time qualified personnel have gradually taken over the direction of the various divisions.

The direction of the work of the board is carried on through eleven divisions with full time personnel. These divisions are Administration, Bacteriology, Crippled Children, Food and Drugs, Maternal and Child Health, Plumbing, Public Health Nursing, Rural Health and Epidemiology, Sanitary Engineering, Tuberculosis Control, and Vital Statistics.

Colorado statutes provide that the board of county commissioners shall act as a local board of health within their jurisdiction, and in the case of cities and towns the city council or trustees shall act as a board of health. Local boards of health are required to appoint a physician, when available, to membership on the board. This appointee then becomes health officer within the jurisdiction of the board.

CHAPTER III

THE POPULATION OF COLORADO

Many factors have entered into the change in population of Colorado counties since 1930. The fluctuation of metal prices has both decreased and increased mining activities at different times in the western counties during this period, accounting for various population changes. The eastern counties, depending entirely on agriculture for an income, have suffered heavy losses from dust storms. Large numbers of the population have migrated to better agricultural lands. Federal aid is now attempting to stabilize this population. Federal rehabilitation projects are developing new agricultural projects in the middle western counties and are moving families into that area from the dust storm counties of Kansas, Oklahoma, and Colorado. Sharp changes in the prices of cattle and sheep have also affected the population of some counties. The central counties, from north to south, representing more than half the population of the state, have been least affected by economic changes.

Considering these known changes in population it is assumed that any estimation of population of the separate counties is open to much criticism. In estimating the population, such factors as automobiles, sales, products, or banking are of little assistance because of the marked changes in economic conditions during this period. Birth rates were considered but could not be used in the estimates because Colorado was not admitted to the birth registration area until 1928, and no accurate trend could be shown.

Three estimates of the county populations were made: (1) on the basis of rural population growth from the 1930 United States census to the Works Progress Administration farm census of 1935, (2) on the basis of urban population growth from the 1920 to the 1930 United States census, and the rural population growth from the 1930 United States census to the 1935 Works Progress Administration farm census, and (3) on the basis of the change in the school census.

In the final estimates of county populations, the estimate made on the school census were accepted where one of the other two estimates did not vary more than 10 per-cent from it. In the remaining counties the estimate used was the one showing the most likely trend of the population as shown by a comparison with other Colorado counties having a comparable source of income, and from other known general data.

A study of population changes (see Table I) indicates that the population of the state has changed little from 1930 to 1938 but that there has been significant shifts in the population within the state

TABLE I

POPULATION OF COLORADO COUNTIES

County	1930 Census	1934 Estimated	1938 Estimated	% Gain 8 Yrs.
Adams	20,245	19,686	21,115	4.3
Alamosa	8,602	8,275	9,943	15.6
Arapahoe	22,647	22,964	27,041	19.4
Archuleta	3,204	3,083	2,962	- 7.6
Baca	10,570	11,490	6,976	-34.0
Bent	9,134	9,023	7,950	-13.0
Boulder	32,456	32,177	34,695	6.9
Chaffee	8,126	8,034	8,320	2.4
Cheyenne	3,723	3,861	2,727	-26.8
Clear Creek	2,155	2,552	3,603	67.2
Conejos	9,803	10,205	10,626	7.3
Costilla	5,779	5,937	6,096	5.5
Crowley	5,934	5,463	5,712	- 3.6
Custer	2,124	2,265	2,406	13.3
Delta	14,204	14,957	14,602	.8
Denver	287,861	280,578	298,512	3.7
Dolores	1,412	1,571	1,730	22.5
Douglas	3,498	3,816	3,631	3.8
Eagle	3,924	4,011	4,098	4.4
Elbert	6,580	6,352	5,323	-19.1
El Paso	49,570	49,917	50,809	2.5
Fremont	18,896	17,757	18,216	- 3.6
Garfield	9,975	10,623	9,879	- 1.0
Gilpin	1,212	1,251	1,290	6.4
Grand	2,108	2,266	2,423	14.9
Gunnison	5,527	5,437	6,306	14.1
Hinsdale	449	480	511	13.8
Huerfano	17,062	17,346	17,630	3.3
Jackson	1,386	1,356	1,327	- 4.3
Jefferson	21,810	23,795	26,477	21.4
Kiowa	3,786	3,619	2,748	-27.4
Kit Carson	9,725	10,396	7,479	-23.1
Lake	4,899	4,934	4,987	1.8
La Plata	12,975	12,404	13,935	7.4
Larimer	33,137	32,209	33,601	1.4
Las Animas	36,008	35,902	35,795	- 0.6
Lincoln	7,850	6,979	5,400	-31.2
Logan	19,946	18,697	17,824	-10.6
Mesa	25,908	27,307	32,733	26.3
Mineral	640	651	662	3.4
Moffat	4,861	4,764	4,348	- 9.8
Montezuma	7,798	7,848	7,897	1.3
Montrose	11,742	11,989	13,503	15.0
Morgan	18,284	17,008	16,099	-12.0
Otero	24,390	22,617	24,129	- 1.1
Ouray	1,784	1,665	2,121	18.9

TABLE I - Continued

POPULATION OF COLORADO COUNTIES

County	1930 Census	1934 Estimated	1938 Estimated	% Gain 8 Yrs.
Park	2,052	2,336	2,620	27.7
Phillips	5,797	5,012	5,575	- 3.8
Pitkin	1,770	1,866	1,731	- 2.2
Prowers	14,762	13,792	11,039	-25.2
Pueblo	66,038	59,296	58,761	-11.0
Rio Blanco	2,980	3,060	2,875	- 3.5
Rio Grande	9,953	10,451	13,685	37.5
Routt	9,352	8,997	9,772	4.5
Saguache	6,250	6,223	6,288	0.6
San Juan	1,935	1,341	2,608	34.7
San Miguel	2,184	2,135	2,566	17.5
Sedgwick	5,580	5,264	4,769	-14.5
Summit	987	935	1,030	4.4
Teller	4,141	4,398	4,655	12.4
Washington	9,591	9,585	7,791	-18.8
Weld	65,097	63,333	62,461	- 4.0
Yuma	13,613	13,472	11,789	-13.4
COLORADO	1,035,791	1,017,049	1,046,207	1.0

(see Figure II). No county on the eastern plains, unless adjacent to Denver, has shown a gain in population, and most counties have apparently experienced a significant loss. This loss probably results from the discouraging agricultural returns of the past few years, due to drought and subsequent dust storms.

The metropolitan area of Denver has shown an increase, although within the city the growth has been slow. From 1930 to 1938 the city has had a population increase of about four per-cent, while the three adjoining counties have increased 15 per-cent in the same period. This would indicate that the suburbs of Denver are growing about four times as fast as the city itself.

The San Luis valley, comprising Rio Grande, Alamosa, Conejos, and Costilla counties, shows a population increase of about 18 per-cent from 1930 to 1938. In this area most of the population depends on agriculture for an income. The soil is highly productive, irrigation water is plentiful, and the surrounding mountains protect from severe weather conditions.

The Colorado river valley counties including Mesa, Delta, Montrose, and Gunnison counties show an increase of 17 per-cent from 1930 to 1938. Conditions in this valley are practically the same as in the San Luis valley, except that government rehabilitation projects have aided in increasing the rate of growth.

Ouray, San Juan, and La Plata counties, high in the mountains, show a 12 per-cent growth in population from 1930 to 1938. The main source of income in these counties is mining, and the activities in mining are shown in the population changes. When metal prices are high and mining is active, there is a rapid increase in population in mining communities, and when mine labor demands decrease, miners must seek employment in other communities. The shift of population in these three counties (see Table I) reflects the mining activities of the past 8 years. It will be noted that these counties showed an 8 per-cent loss from 1930 to 1934, but by 1938 they had regained the loss and gained 12 per-cent over the 1930 population.

The significant change of population within the state from 1930 to 1938 is a movement from the eastern drought-stricken areas into the fertile agricultural valleys of the western slope, the mining areas, and the metropolitan districts.

The uneven distribution of the population within the state is due, mainly, to its topography. The eastern plains are inhabited in proportion to the availability of water supply for irrigation, while the western slope population is concentrated in fertile river valleys, leaving wide areas of rugged mountain districts sparsely populated, except in the prosperous mining communities.

Denver, which is the only large city in Colorado, contains 28 per-cent of the population of the state (see Figure III) and 50 per cent of the state population lives within a radius of 100 miles of it.

The population density of the state averages 10 persons per square mile, but excluding Denver, the population density for the remainder of the state is approximately 7 per square mile. Density by counties (see Table II) ranges from 4,963 in Denver to 0.5 in Hinsdale County. There are five counties with a population density less than one person per square mile (see Figure IV), eight counties with densities between one and two, and five counties with densities between two and three. Of these 18 counties, only two are on the eastern slope. The reason for their sparse population is scarcity of irrigation water to support agriculture on a profitable scale. The remaining 16 counties with densities under three, are located on the western slope in the rugged mountain districts. The small populations of these counties are confined mainly to narrow river valleys where agriculture is profitable.

Lake County stands out in population density on the western slope because of the concentration of population in Leadville. This community contains several large ore smelters, and functions as a wholesale and retail center for supplies to the nearby mines.

The heaviest population density will be noticed in the eastern foothills and the plains adjoining them. In this district unlimited water is available for irrigation and domestic purposes, and junctions of trans continental roads, railroads, and airways furnish an ideal situation for wholesale and retail trade. The City of Denver, for this reason, contains more Federal Government offices than any city of the United States outside of Washington, D. C.

The rural and urban distribution of the population in 1930, exclusive of Denver was as follows:

	No. Towns and Cities	Population	Population Per-cent
Population under 1,000	158	59,893	8.0
Population, 1,000-2,500	42	60,822	8.1
Population, 2,500-10,000	19	91,792	12.3
Population, 10,000-50,000	6	90,131	12.1
Population over 50,000	1	50,096	6.7
Total in towns and cities		352,734	47.2
Outside towns and cities		395,197	52.8
Total		747,931	100.0

FIGURE II

POPULATION CHANGE - COLORADO 1930 TO 1938

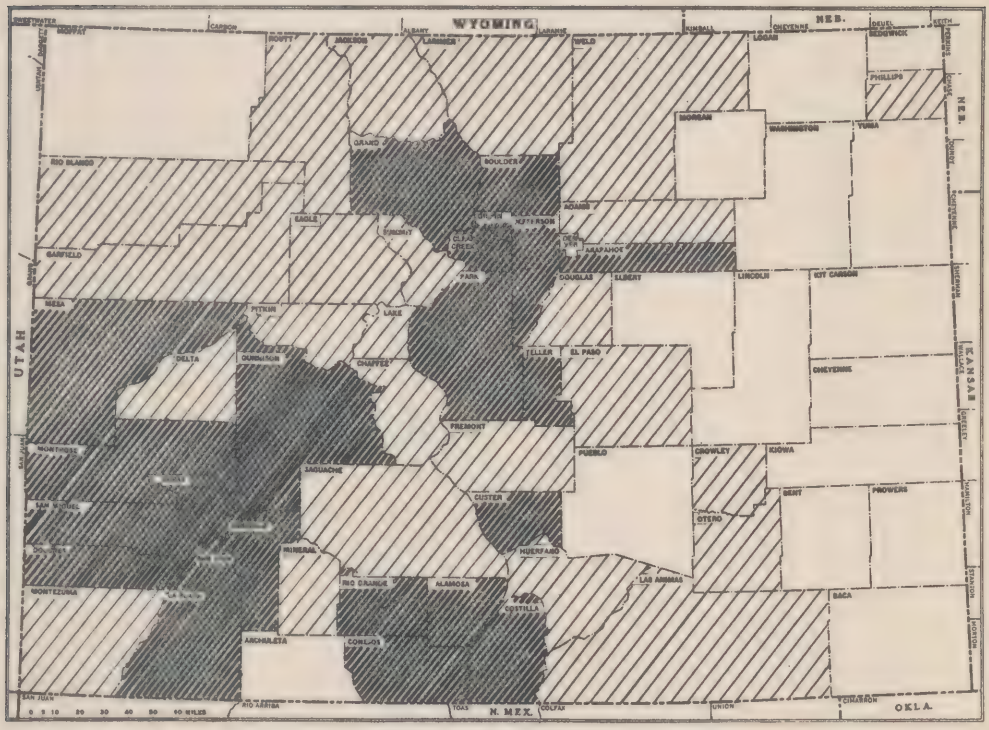


FIGURE III

STATE OF COLORADO

WITH COUNTY AREAS REPRESENTING POPULATION OF 1930

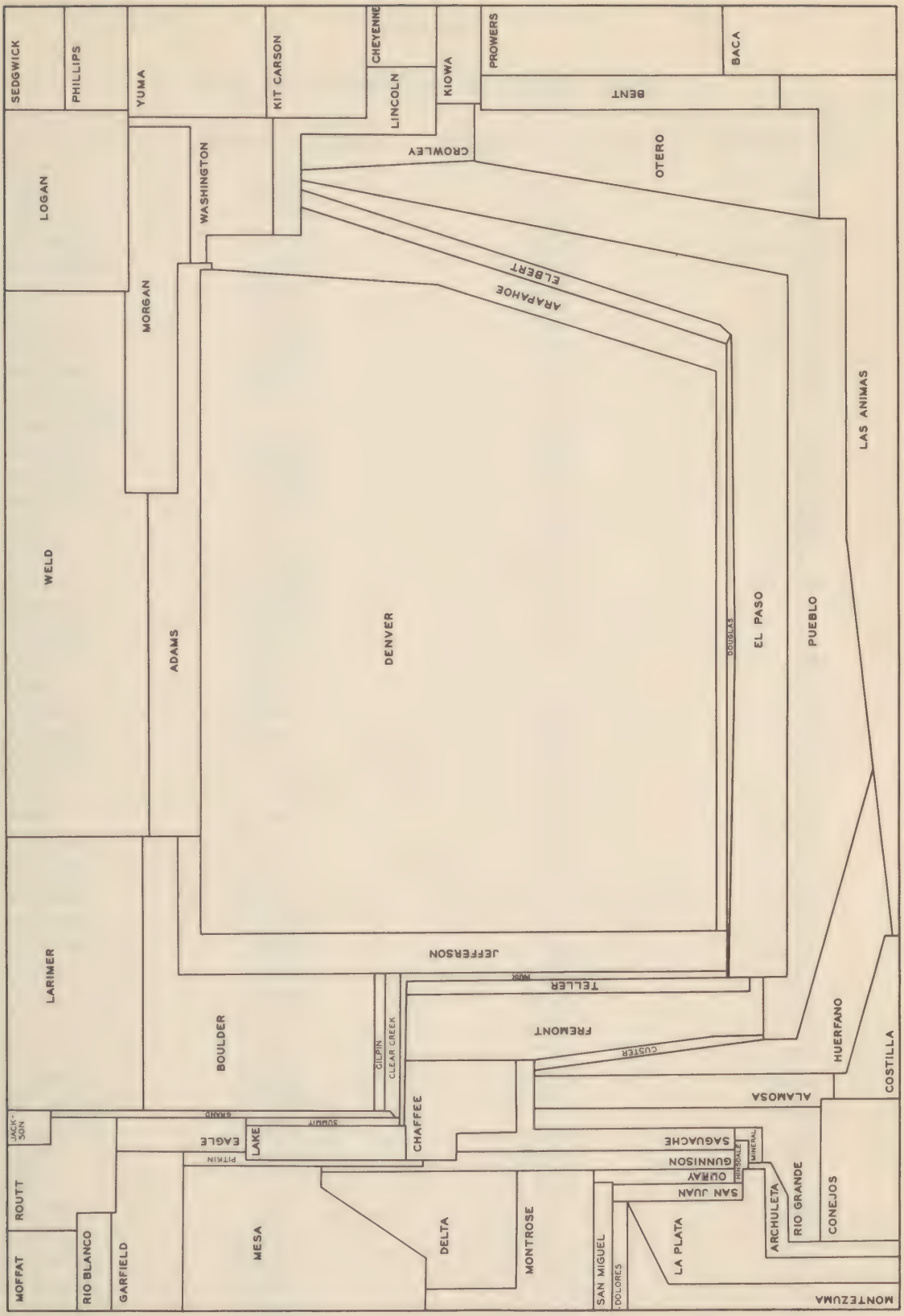


TABLE II

AREA AND POPULATION, COLORADO, 1930

County	Area Sq. Miles	Pop. Per Sq. Mile	% State Pop.
Adams	1,262	16.0	1.95
Alamosa	727	11.8	.83
Arapahoe	842	26.9	2.19
Archuleta	1,220	2.6	.31
Baca	2,552	4.1	1.02
Bent	1,524	6.0	.88
Boulder	764	42.5	3.13
Chaffee	1,083	7.5	.78
Cheyenne	1,777	2.1	.36
Clear Creek	390	5.5	.21
Conejos	1,252	7.8	.95
Costilla	1,185	4.9	.56
Crowley	808	7.3	.57
Custer	747	2.8	.21
Delta	1,201	11.8	1.37
Denver	58	4,963.2	27.79
Dolores	1,030	1.4	.14
Douglas	845	4.1	.34
Eagle	1,620	2.4	.38
Elbert	1,857	3.5	.64
El Paso	2,121	23.4	4.78
Fremont	1,557	12.1	1.82
Garfield	3,107	3.2	.96
Gilpin	132	9.2	.12
Grand	1,866	1.1	.20
Gunnison	3,179	1.7	.53
Hinsdale	971	0.5	.04
Huerfano	1,500	11.4	1.65
Jackson	1,632	0.8	.13
Jefferson	808	27.0	2.11
Kiowa	1,798	2.1	.37
Kit Carson	2,159	4.5	.94
Lake	371	13.2	.47
La Plata	1,851	7.0	1.25
Larimer	2,629	12.6	3.20
Las Animas	4,809	7.5	3.48
Lincoln	2,570	3.1	.76
Logan	1,822	10.9	1.93
Mesa	3,163	8.2	2.50
Mineral	866	0.7	.06
Moffat	4,658	1.0	.47
Montezuma	2,051	3.8	.75
Montrose	2,264	5.2	1.13
Morgan	1,286	14.2	1.76
Otero	1,259	19.4	2.35
Ouray	519	3.4	.17

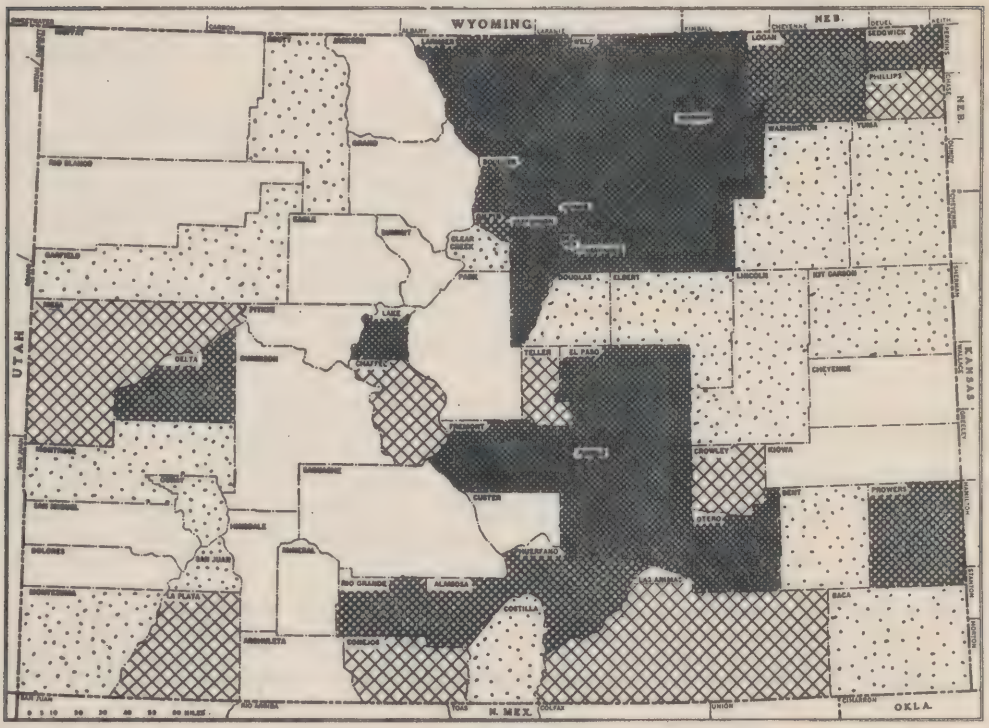
TABLE II - Continued

AREA AND POPULATION, COLORADO, 1930

County	Area Sq. Miles	Pop. Per Sq. Mile	% State Pop.
Park	2,242	0.9	.20
Phillips	688	8.4	.56
Pitkin	1,019	1.7	.17
Prowers	1,630	9.1	1.42
Pueblo	2,433	27.1	6.37
Rio Blanco	3,223	0.9	.29
Rio Grande	898	11.1	.95
Routt	2,309	4.1	.90
Saguache	3,133	2.0	.60
San Juan	453	4.3	.19
San Miguel	1,301	1.7	.21
Sedgwick	531	10.5	.54
Summit	649	1.5	.10
Teller	547	7.6	.40
Washington	2,521	3.8	.93
Weld	4,022	16.2	6.28
Yuma	2,367	5.8	1.31
COLORADO	103,658	10.0	100.00

FIGURE IV

CONCENTRATION OF POPULATION - COLORADO 1930



For the entire state approximately 50 per-cent of the population lives in cities over 2,500; but if Denver is excluded, 63 per-cent of the remaining population may be classified as rural, with 16 per-cent of the rural population living in 200 towns under 2,500; and 19 cities over 2,500; 6 of them exceeding 10,000 in population; while the western slope, representing 18 per-cent of the population, has 72 towns under 2,500 and 8 cities over 2,500 and only one city over 10,000.

RACE AND NATIVITY

In 1930, the while population of Colorado represented about 93 per-cent of the total. The native whites made up 84.5 per-cent, and foreign born whites 8.2 per-cent. For the United States, 77.8 per-cent of the population was native white, and 10.9 per-cent foreign born white. The state has drawn a relatively small portion of its population from foreign countries. As approximately 50 per-cent of the residents have been born in other parts of the United States, it would appear that immigration to Colorado has been mainly of native born Americans.

The foreign born white population within the state (see Table III) shows a concentration within the mining regions. Of the seven Colorado counties with a foreign born white population greater than 12 per-cent, all are on the western slope in mountainous districts where mining is the principal occupation.

Race problems in Colorado are of little importance, with the exception of the Mexican population. The 1930 census lists the following races comprising more than one per-cent of the state population:

White - - - - - - - - - -	92.7 per-cent
Mexican - - - - - - - - -	5.6 per-cent
Negro - - - - - - - - - -	1.1 per-cent

Previous to 1930, Mexicans were listed among the white population and consequently only one official tabulation of them has been recorded. Instructions given to the enumerators of the 1930 census were that, "all persons born in Mexico, or having parents born in Mexico, who are not definitely White, Negro, Indian, Chinese or Japanese should be returned as Mexican" (9). Under these instructions 65,968 persons of Mexican birth or parentage were returned as white. There apparently was some confusion in the minds of the enumerators in making the Mexican classification, and from the writer's personal observation in frequent travels through Colorado he would place the figure higher than the census. Waller (10) in 1931, estimated that 15 per-cent of the permanent Colorado population was Spanish speaking, but gave no basis for his estimate. Apparently, some of the Mexicans have been classified as white, and the official census figures are not a true picture of the situation. From available data, it would appear that perhaps a five per-cent increase

in the Mexican enumeration would more nearly approach the true numbers. Assuming that the error in tabulation was made in the same proportion throughout the state, although the total numbers may be error, the concentration in the counties will still give a true picture of their distribution over the state.

The census figures show only three Colorado counties with no Mexican population (see Table III), 21 counties with less than three per-cent, 18 counties with three to six per-cent, 8 counties with 6 to 9 per-cent, and 13 counties with 9 per-cent or more. The heaviest concentration is in Archuleta County where 48.6 per-cent of the population is Mexican. The migration of agricultural laborers into the United States from south of the border has been encouraged for many years by farmers of the western states because Mexicans are generally satisfied with low wages. This has resulted in a concentration of the racial group in those counties where agriculture is the main source of income.

Much of the Colorado Mexican population is found in the river valleys with the exception of the Yampa and White rivers in the northwest corner of the state (see Figure V). Here, few farm crops are grown which require much labor, most of the land being used for grazing. On the eastern slope, the concentration in the north parallels the Platte river, and in the south follows that of the Arkansas river. On the western slope, in the central portion, it follows the course of the Colorado river, and in the south is in the San Luis and San Juan valleys.

The Mexican population of the state is of special interest in public health because of its low economic status, poor environmental conditions, high incidence of illness and nutritional disturbances, and migratory habits. Special studies of this group have been rarely attempted because of the difficulty in separating them from the remaining white population.

No data are available to study trends of any factors of this group because the United States census of 1930 was the first attempt to separate them from other whites.

Comprising approximately one per-cent of the state population, Negroes are of little importance except in the city of Denver, where 7,204 Negroes make up 2.5 per-cent of the population. Negroes residing in Denver, El Paso, and Pueblo counties represent 81.4 per-cent of the Negro population of the state. The state Negro population increased 4.5 per-cent from 1920 to 1930.

Negroes do not live comfortably in the usual Colorado climate and rarely is one seen in the cool mountain districts. Practically all of them are employed as servants or by the railroads.

TABLE III

RACE AND NATIVITY, COLORADO, 1930

County	% Native White	% Foreign Born White	% Mexican
Adams	80.8	10.5	5.9
Alamosa	90.8	2.5	5.9
Arapahoe	90.9	7.3	1.0
Archuleta	49.4	1.5	48.6
Baca	98.7	0.8	0.5
Bent	85.7	2.6	9.5
Boulder	85.6	8.3	5.2
Chaffee	79.0	9.5	10.9
Cheyenne	93.8	4.9	1.2
Clear Creek	86.6	12.5	0.3
Conejos	98.1	0.9	2.7
Costilla	92.4	1.1	3.3
Crowley	72.2	4.9	20.9
Custer	86.2	7.9	4.2
Delta	88.8	3.9	6.9
Denver	84.0	10.9	2.4
Dolores	91.1	6.4	2.0
Douglas	90.4	6.3	3.2
Eagle	82.4	7.5	9.9
Elbert	93.5	5.4	0.7
El Paso	89.6	6.6	1.5
Fremont	84.6	9.3	4.9
Garfield	88.9	7.5	3.4
Gilpin	84.9	14.4	0.7
Grand	90.0	8.3	1.3
Gunnison	82.2	12.9	4.6
Hinsdale	89.5	6.5	3.3
Huerfano	73.6	10.5	14.2
Jackson	89.8	8.2	2.1
Jefferson	89.2	9.7	4.2
Kiowa	95.3	2.3	1.6
Kit Carson	96.4	3.5	1.2
Lake	73.7	20.1	5.8
La Plata	76.7	6.0	13.5
Larimer	85.2	8.5	6.2
Las Animas	77.3	9.5	13.2
Lincoln	95.4	3.5	1.1
Logan	86.7	8.5	4.1
Mesa	90.9	4.9	3.8
Mineral	88.4	6.6	4.8
Moffat	94.5	4.7	0.7
Montezuma	81.0	2.6	11.1
Montrose	84.5	4.7	10.1
Morgan	82.6	9.4	7.6
Otero	78.2	3.1	16.2
Ouray	87.0	12.8	0.0

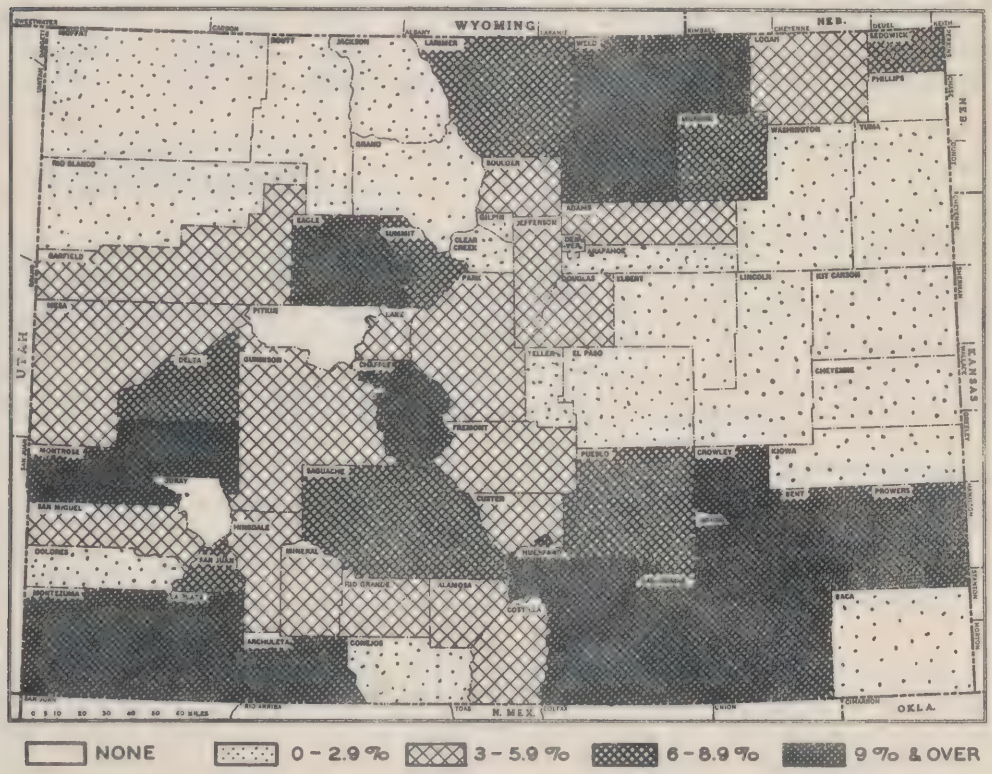
TABLE III - Continued

RACE AND NATIVITY, COLORADO, 1930

County	% Native White	% Foreign Born White	% Mexican
Park	90.8	5.8	3.3
Phillips	95.3	4.5	0.0
Pitkin	77.6	22.1	0.0
Prowers	87.3	2.5	9.7
Pueblo	80.1	9.6	8.1
Rio Blanco	94.9	3.5	1.1
Rio Grande	93.3	2.3	4.3
Routt	86.4	9.0	2.4
Saguache	88.9	3.0	8.1
San Juan	67.9	23.8	8.1
San Miguel	85.7	10.8	3.3
Sedgwick	84.8	6.6	6.9
Summit	86.7	12.6	7.1
Teller	89.2	10.3	0.3
Washington	93.7	4.7	1.1
Weld	75.6	9.5	13.5
Yuma	96.9	2.8	0.2
COLORADO	84.5	8.2	5.6
UNITED STATES	77.8	10.9	1.2

FIGURE V

DISTRIBUTION OF MEXICAN POPULATION — COLORADO, 1930



A few Japanese reside in the state, their total number being 3,213. Most of them follow agricultural occupations, and they are generally found in small colonies in the fertile river valleys. Approximately 10 per-cent of the state's Japanese population resides in Denver where many of them are engaged in business.

Indians have almost vanished from the state. Of the 1,395 residing there in 1930, about 60 per-cent of them lived in La Plata and Montezuma counties on, or close to the state's only Indian reservation. From 1920 to 1930 the Colorado Indian population increased about one per-cent.

AGE AND SEX DISTRIBUTION

Age distribution of the population is of importance in surveying the health status of a community and predicting future births, deaths, and fertility. It is obviously not good practice to compare death rates of population groups having widely different characteristics. Likewise, it is not desirable to compare crude birth rates of groups having different proportions of individuals of reproductive ages.

Unfortunately, age data of our population are available only for census years and specific rates can be computed only for those years. For intercensus years, the common practice is to compute crude death rates, but these must not be interpreted without the last known age distributions.

The United States, from 1920 to 1930, showed a decrease in the proportionate number of individuals in the population under 15 years of age (see Table IV), and an increase in the group over 45 years of age. The productive age groups (15-44 years) have shown slight increases.

Colorado, from 1920 to 1930, showed one per-cent decrease in the age groups under 15 years, while this classification for the United States decreased 1.4 per-cent during the same period. The increases in the groups over 45 years of age were: Colorado 2.8 per-cent, the United States 1.9 per-cent. The reproductive age population (15-44) of Colorado decreased 1.0 per-cent while in the United States it increased 0.4 per-cent.

The age problem of Colorado is that of a population growing older at a more rapid rate than the United States, with a decreasing reproductive age population reproducing at a greater rate than the United States where the reproductive age group is growing.

The age groups under five years and over 65 years are important to public health administrators because they may be used as an

index of the problems of infancy and senility. The separate Colorado counties show a wide variation in the distribution of these groups within their total population.

The population under five years of age varies from 7.0 per-cent in Denver (see Table V) to 14.4 per-cent in Conejos and Costilla counties. There are 8 Colorado counties with less than 8.0 per-cent under five years, 22 counties with 8.0 to 9.5 per-cent, 12 counties with 9.5 to 11.0 per-cent, 15 counties with 11.0 to 12.5 per-cent, and 6 counties with 12.5 per-cent or more.

The geographical distribution (see Figure VI) of this group shows the heaviest concentration in the San Juan and San Luis valleys in the southwest corner of the state and the smallest group in the White and Yampa river valleys in the northwest corner of the state. All of the counties with less than 8 per-cent under five years of age either have a high concentration of urban population, or are in high mountain districts where female population is low.

The population over 65 years of age varies from 3.2 per-cent in Alamosa county (see Table V) to 11.3 per-cent in Pitkin county. There are five counties with less than four per-cent under 65 years, 22 counties with four to five per-cent, 13 counties with five to six per-cent, 9 counties with 6 to 7 per-cent, and 14 counties with 7 per-cent or more.

The geographical distribution (see Figure VII) of this group shows a concentration in the central part of the state, extending westward along the Colorado river valley. There is a marked concentration in the high mountain counties. The lowest concentrations extend over the eastern plains area, and along the entire southern border, reaching the lowest in the Arkansas river valley.

Sex enumeration is probably the most dependable item recorded in the United States census, because rarely does an enumerator have any difficulty in determining the sex of an individual. Sex ratios show the highest excess of males in the foreign born population, but males also outnumber females in all other classes. The male excess reached its highest proportion in the United States in 1910 and has been decreasing since that time. In 1920, the male population was 51.0 per-cent of the total and in 1930 it was 50.6 per-cent.

For many years Colorado has had a male population slightly higher than the United States. This is probably due to large areas of the state where living is hazardous and which women tend to avoid. The male population of Colorado in 1920 was 52.4 per-cent of the total and by 1930 had dropped to 51.2 per-cent.

TABLE IV

AGE DISTRIBUTION 1920 AND 1930

	COLORADO		UNITED STATES	
Age	% 1920	% 1930	% 1920	% 1930
Under 5	10.3	9.2	10.9	9.3
5-9	10.1	10.1	10.8	10.3
10-14	9.5	9.5	10.1	9.8
15-19	8.4	9.2	8.9	9.4
20-24	8.3	8.4	8.8	8.9
25 29	8.4	7.4	8.6	8.0
30-34	8.0	7.2	7.6	7.4
35-44	14.3	14.2	13.4	14.0
45 54	10.7	11.2	10.0	10.6
55 64	6.8	7.5	6.2	6.8
65 and over	4.4	6.0	4.7	5.4

TABLE V

SEX AND AGE DISTRIBUTION, COLORADO, 1930

County	% Males	% Females 15-44 Yrs.	Both Sexes % Under 5 Yrs.	Both Sexes % Over 65 Yrs.
Adams	54.9	21.0	9.4	4.9
Alamosa	51.7	24.0	12.4	3.2
Arapahoe	52.0	22.1	9.4	5.7
Archuleta	52.9	19.9	13.5	5.1
Baca	54.0	21.0	12.4	3.5
Bent	54.6	21.6	10.4	4.0
Boulder	49.8	22.4	8.1	7.7
Chaffee	53.7	21.0	9.3	6.3
Cheyenne	54.3	20.7	10.2	4.6
Clear Creek	52.4	19.9	7.2	10.8
Conejos	51.4	21.1	14.4	4.1
Costilla	51.6	20.2	14.4	4.3
Crowley	52.9	20.8	11.8	4.6
Custer	54.5	19.6	9.7	8.4
Delta	51.9	21.0	10.1	6.7
Denver	48.5	25.9	7.0	6.9
Dolores	54.7	20.5	11.7	4.5
Douglas	55.0	21.0	8.6	5.8
Eagle	57.8	21.5	9.9	5.5
Elbert	54.0	20.7	10.4	4.8
El Paso	47.8	23.8	7.0	8.8
Fremont	53.6	20.6	8.3	7.3
Garfield	53.1	21.7	9.3	6.9
Gilpin	55.9	18.8	8.7	8.7
Grand	58.4	18.2	8.8	5.9
Gunnison	55.6	21.0	10.3	5.7
Hinsdale	58.6	18.5	7.4	6.0
Huerfano	52.7	21.6	12.6	3.9
Jackson	58.0	19.3	9.6	5.6
Jefferson	51.6	22.5	7.9	6.4
Kiowa	54.6	20.1	9.2	4.7
Kit Carson	52.7	21.0	11.2	4.2
Lake	54.5	21.0	7.8	7.4
La Plata	53.1	21.9	11.1	5.7
Larimer	50.7	22.0	9.3	6.5
Las Animas	51.8	21.9	12.2	4.2
Lincoln	52.9	21.0	10.1	4.7
Logan	51.9	22.3	11.2	3.8
Mesa	51.5	22.1	9.4	6.6
Mineral	56.9	19.5	8.3	8.6
Moffat	55.9	20.0	9.3	5.2
Montezuma	53.5	20.3	12.6	4.9
Montrose	53.9	20.9	10.8	6.1
Morgan	51.8	21.9	11.5	4.7
Otero	51.2	22.4	11.0	4.8
Ouray	58.3	19.8	8.7	10.2

TABLE V - Continued

SEX AND AGE DISTRIBUTION, COLORADO, 1930

County	% Males	% Females 15-44 Yrs.	Both Sexes % Under 5 Yrs.	Both Sexes % Over 65 Yrs.
Park	58.8	19.3	8.2	7.0
Phillips	53.5	21.6	10.0	4.8
Pitkin	55.3	18.2	8.2	11.3
Prowers	52.8	21.8	11.2	4.3
Pueblo	51.1	23.8	9.1	5.5
Rio Blanco	57.7	20.7	9.4	5.9
Rio Grande	51.3	21.2	11.8	5.5
Routt	56.3	20.5	9.3	4.8
Saguache	55.6	20.7	13.0	4.6
San Juan	65.4	18.3	7.1	4.7
San Miguel	55.3	18.8	9.3	7.4
Sedgwick	53.5	21.4	11.2	3.8
Summit	59.1	19.5	6.5	8.9
Teller	55.0	19.5	8.5	9.6
Washington	54.1	20.8	11.3	4.8
Weld	52.3	21.7	11.2	4.3
Yuma	52.8	21.2	10.9	5.3
COLORADO	51.2	23.0	9.2	6.0
UNITED STATES	50.6	23.8	9.3	5.4

FIGURE VI

DISTRIBUTION OF POPULATION UNDER 5 YEARS OF AGE
COLORADO 1930

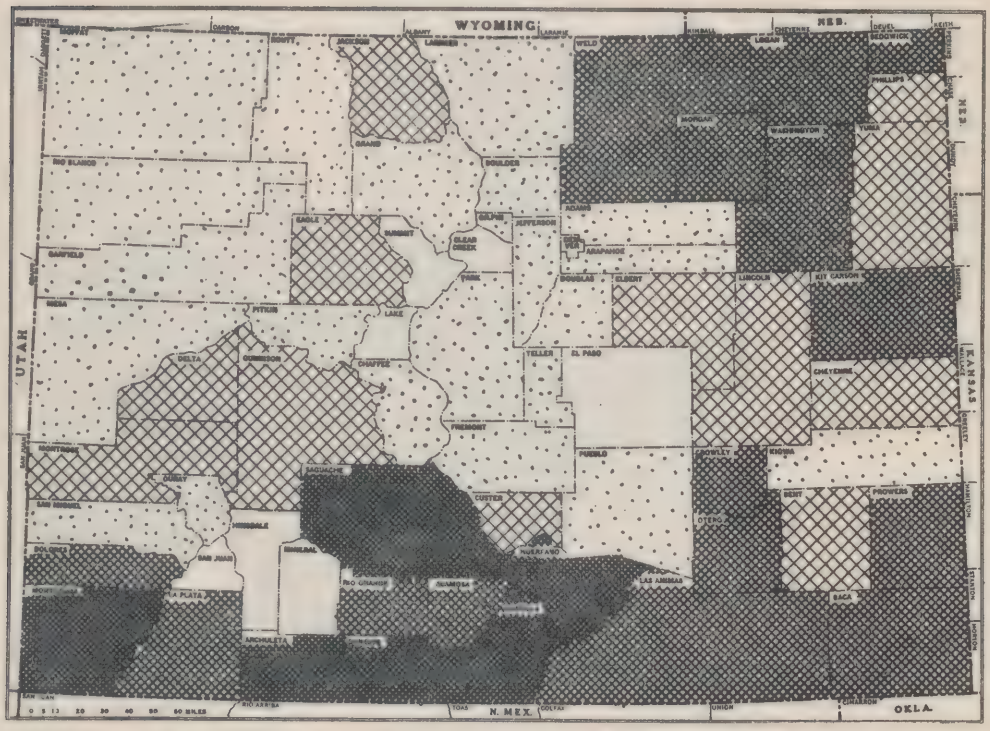
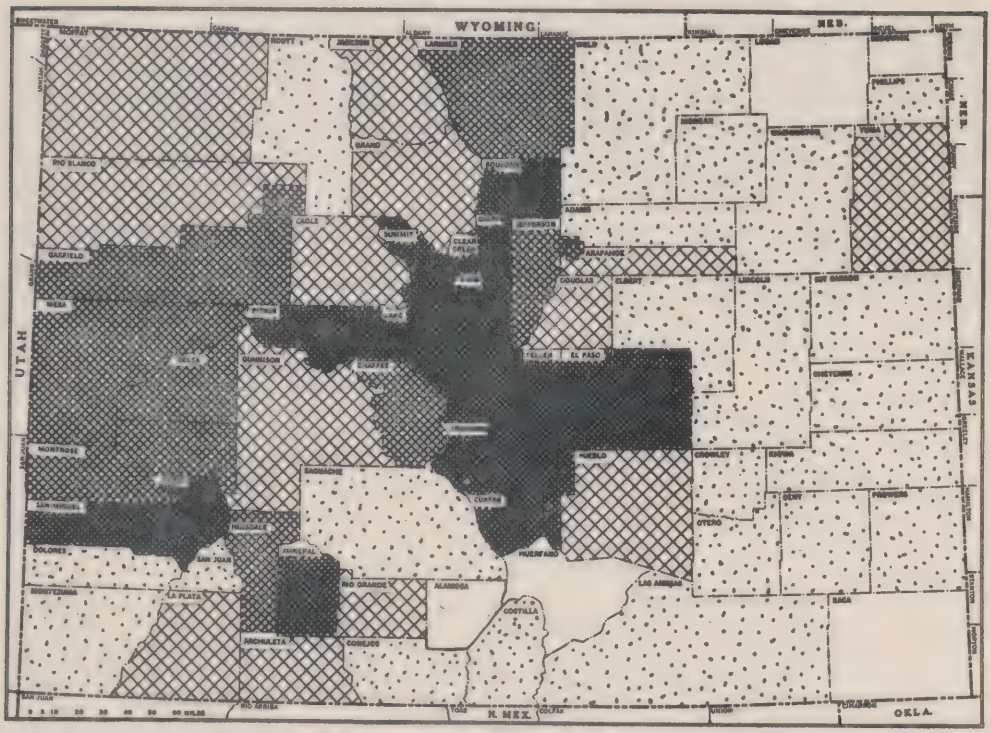


FIGURE VII

DISTRIBUTION OF POPULATION 65 YEARS & OVER
COLORADO 1930



Distribution of male population varies from 65.4 per-cent in San Juan county to 47.8 per-cent in El Paso county. There are 17 counties with over 55.0 per-cent male population (see Table V), all of which are located on the western slope in rough mountain districts where mining and grazing are the principal occupations. Only two counties, El Paso and Denver, have a male population less than 50 per-cent.

The portion of the female population of reproductive age (15-44 years) is of particular interest to public health administrators. In 1930, this group comprised 23.8 per-cent of the United States population, and 23.0 per-cent of the Colorado population. Among the Colorado counties, only Denver (see Table V) had a higher per-cent in this group than the United States. Two counties, El Paso and Pueblo, equalled the United States and the remaining counties were lower. As might reasonably be expected, the counties having the lowest ratios of females of reproductive age to the total population are those in which there is an excess of males.

CHAPTER IV

VITAL STATISTICS

The basic figures from which mortality, natality, and morbidity rates are computed are rarely accurate. Population figures are reasonably accurate only for the census years, and rates based on population estimates of intercensus years are subject to variations depending on the method selected for the estimations. The rates referred to in the following paragraphs are based on population estimates taken from Chapter III, and although they are subject to the usual errors of any population estimates they will be used throughout the following discussions.

The author realizes that rates calculated for the separate Colorado counties are open to criticism because of the small samples involved in the sparsely settled counties. Because of this, due consideration was given to setting up the county rates on the basis of five year average experiences, but this plan had to be abandoned because allocations for residence of births and deaths were first made in the state for the 1938 records. It was thought that a better picture of county rates could be obtained from one year of allocated reports than from a five year average of recorded experiences.

NATALITY

Although Colorado was admitted to the United States Registration Area in 1928, Whelpton (11) estimated that not more than 83.16 percent of its 1929 births were reported. On this basis the true birth rate for the state, in 1929, would be 20.99 per 1,000 population rather than 17.46 computed from the registered births.

Whelpton (11) also indicates that the completeness of birth registrations in the states increases with the length of time that a state is listed in the Registration Area. The increase, as shown by the United States Census Bureau, in Colorado birth rates from 1930 to 1938 may be due to better reporting of births rather than an actual increase in the rate of reproduction.

The resident live birth rate for the state, in 1938 was 19.5 per 1,000 population. The rates in the separate counties (see Table VI) varied from 9.8 in Hinsdale to 37.4 in Park County. The geographical areas showing the heaviest birth rates are (see Figure VIII) the San Juan valley and the northern half of the western slope of the Continental Divide. These areas in general have a large portion of the population engaged in mining and have an excess of male population, but the young adult portion of the population is a little higher than the state as a whole. It is interesting to note too, that some of the counties with

TABLE VI

NATALITY, FERTILITY, AND INFANT DEATHS, COLORADO COUNTIES, 1938

COUNTIES	BIRTHS ALLOCATED NUMBER	BIRTHS ALLOCATED RATE/1000 POP.	FERTILITY RATE	ALLOCATED INFANT DEATHS NUMBER	ALLOCATED INFANT DEATHS RATE/1,000 BIRTHS
Adams	318	15.1	44.7	20	62.9
Alamosa	210	21.1	51.6	30	142.9
Arapahoe	414	15.3	42.6	16	38.6
Archuleta	74	25.0	67.8	10	135.1
Baca	119	17.1	59.1	7	58.8
Bent	182	22.9	48.4	16	87.9
Boulder	705	20.3	36.2	41	58.2
Chaffee	133	16.0	74.6	11	82.7
Cheyenne	53	19.4	49.4	3	56.6
Clear Creek	94	26.1	36.4	8	85.1
Conejos	222	20.9	68.2	21	94.6
Costilla	104	17.1	71.2	6	57.7
Crowley	131	22.9	56.6	16	122.1
Custer	47	19.5	49.2	3	63.8
Delta	370	25.3	48.1	16	43.2
Denver	5,299	17.8	27.0	263	49.6
Dolores	47	27.2	56.9	5	106.4
Douglas	61	16.8	41.0	2	32.8
Eagle	113	27.6	48.0	13	115.0
Elbert	92	17.3	50.4	2	21.7
El Paso	850	16.7	29.7	39	45.9
Fremont	291	16.0	40.4	15	51.5
Garfield	244	24.7	42.8	11	45.1
Gilpin	18	14.0	46.5	--	--
Grand	59	24.3	48.3	--	--
Gunnison	133	21.1	49.2	2	15.0
Hinsdale	5	9.8	39.8	--	--
Huerfano	249	14.1	58.6	31	124.5
Jackson	45	33.9	49.6	2	44.4
Jefferson	371	14.0	35.3	13	35.0
Kiowa	48	17.5	45.7	--	--
Kit Carson	135	18.1	53.4	11	81.5
Lake	165	33.1	37.4	25	151.5
La Plata	380	27.3	50.8	30	78.9
Larimer	655	19.5	42.2	33	50.4
Las Animas	719	20.1	55.6	69	96.0
Lincoln	129	23.9	47.6	5	38.8
Logan	425	23.8	50.1	18	42.4
Mesa	656	20.1	42.5	41	62.5
Mineral	16	24.2	42.4	1	62.5
Moffat	79	18.2	46.6	--	--
Montezuma	279	35.3	62.1	31	111.1
Montrose	282	20.9	51.6	22	78.0
Morgan	396	24.6	52.4	16	40.4
Otero	551	22.8	49.3	42	76.2
Ouray	45	21.2	44.1	3	66.7

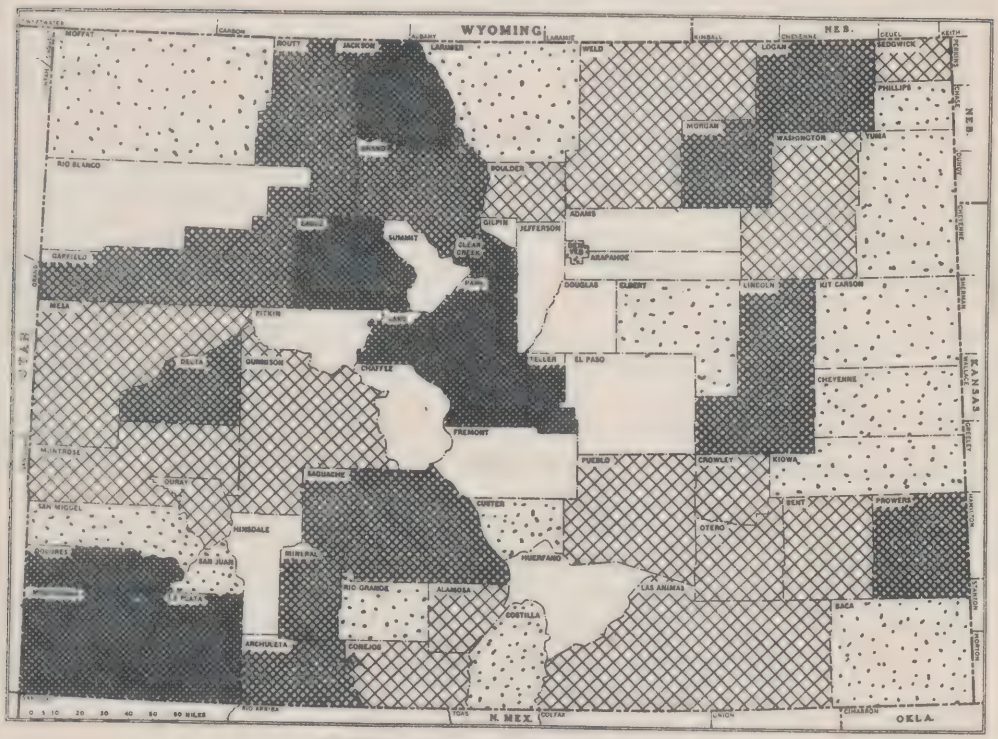
TABLE VI - Continued

NATALITY, FERTILITY, AND INFANT DEATHS, COLORADO COUNTIES, 1938

COUNTIES	BIRTHS ALLOCATED		FERTILITY RATE	ALLOCATED INFANT DEATHS	
	NUMBER	RATE/1,000 POP.		NUMBER	RATE/1,000 BIRTHS
Park	98	37.4	42.3	8	81.6
Phillips	104	18.7	46.2	6	57.7
Pitkin	29	16.8	45.0	1	34.4
Prowers	274	24.8	51.2	15	54.7
Pueblo	1,192	20.3	38.3	67	56.2
Rio Blanco	38	13.2	45.3	2	52.6
Rio Grande	236	17.2	52.9	32	135.6
Routt	242	24.8	45.4	16	66.1
Saguache	153	24.3	62.8	15	98.0
San Juan	50	19.2	38.7	2	40.0
San Miguel	49	19.1	49.6	5	102.0
Sedgwick	107	22.4	52.5	7	65.4
Summit	13	12.6	33.3	3	23.0
Teller	141	30.3	43.4	15	106.4
Washington	156	20.0	54.6	7	44.9
Weld	1,330	21.3	51.6	63	47.4
Yuma	225	19.1	51.6	10	44.4
COLORADO	20,450	19.5	40.2	1,243	60.8

FIGURE VIII

THE BIRTH RATE – COLORADO 1938
ALLOCATED FOR RESIDENCE



BIRTHS PER 1,000 POPULATION

UNDER 17 | 17 – 19.9 | 20 – 22.9 | 23 – 25.9 | 26 & OVER

an unusually low birth rate are also in the mountain districts, with most of the other low rate counties following pretty generally the areas of heaviest population concentration and urbanization.

Considering the state by districts, (see Appendix) we note that the western slope birth rates average about four births per thousand population more than the eastern slope. The east central plains area presents the lowest birth rate of 17.4 per 1,000 population, with the City and County of Denver a close second with a rate of 17.8.

FERTILITY

It is only for the census years that we have accurate data on the age and sex distributions of our population and our latest available census records are those of 1930. The best analysis of the fertility of the populations of the state would be a study of the ratio of the births in a population to the number of females of reproductive age in the same area. To get a true picture of such a ratio it would be necessary to use allocated births. Colorado birth reports were not allocated for residence of the mother in 1930, and therefore are not available. The next best ratio of fertility is the comparison of the children under five years of age to the females 15 to 44 years of age, for which all data are available from the United States census reports of 1930.

The fertility rate expressed as the number of children under five years of age per hundred females, ages 15 to 44 years, for the United States in 1930 was 39.1 and for the State of Colorado was 40.2. This would indicate that Colorado women were reproducing at a slightly faster rate than the average for the United States.

The fertility rates in the separate counties (see Table VI) ranged from 27.0 in Denver to 74.6 in Chaffee County. The most highly urbanized areas have the lowest fertility rates. This is probably accounted for by the large numbers of young women who live in such areas for the purpose of employment. Many such young women are unmarried, or if married tend to avoid pregnancy because it interferes with their income. This phenomenon is most striking in the City and County of Denver where we find a smaller proportion of the population under five years of age, a lower birth rate, and a lower fertility rate than any other district of the state (see Appendix).

A study of the county distribution of fertility (see Figure IX) indicates that most fecund women of the state are concentrated along its entire southern edge extending northward through the San Luis valley. In comparing this distribution with the birth rates (see Figure VIII) it is observed that high fertility does not necessarily follow high birth rates. This is especially noticeable in the southern part of the Arkansas Valley where fertility is high but the birth rate is low, and in the

group of counties in the northern half of the western slope of the Continental Divide, where the birth rates are high but the fertility rates are not.

We must give full consideration to the fact that birth rates of 1938 have been compared to fertility rates of 1930, but both rates can not be computed for the same year. Referring to the changes of population within the separate counties during an eight year period (see Figure II), it is readily seen that conclusions based on these comparisons might be subject to significant errors.

INFANT MORTALITY

The infant mortality rate for Colorado has been decreasing rapidly over the past decade, but as pointed out previously, this may be due to the better reporting of live births, upon which this rate is computed. Even with the great increase of expenditures in Child Welfare work in the state during the past few years, it is doubtful if there has been any appreciable savings in children's lives. Child health programs to date have only scratched the surface of the problem and much remains to be done in reducing the present rate of infant mortality.

Colorado's infant mortality rate of 60.8 deaths per 1,000 live births is high compared to the other states. In 1938 it was exceeded by only 9 other states of the nation. Many communities of the United States have been able to demonstrate rates below 30.0 which means that a child born in these communities has twice the chance of reaching its first birthday as a child born in Colorado.

Only eight of the separate Colorado counties, in 1938, had an infant death rate under 30.0 (see Table VI) with five of these reporting no infant deaths. Since all counties reporting no deaths or a rate less than 30.0 have small populations, these rates representing a single year can not be considered as highly significant, because in four of the counties, one additional infant death, and in the other four counties, two additional deaths would have given an infant death rate over 30.0.

In the geographical distribution of infant death rates (see Figure X) we see the lowest county rates concentrated in the eastern and northern portion of the state, and the highest rates concentrated in the San Luis valley and extending along the southern border.

In areas where birth rates are high, infant mortality rates are generally expected to be high. The Colorado counties with high birth rates (see Figure VIII) do not coincide with those of high infant mortality. There is however, a suggestion of a direct relation between fertility (see Figure IX), and infant mortality in Colorado counties.

FIGURE IX

COLORADO - 1930

RATIO OF NUMBER OF CHILDREN UNDER 5 YRS. TO FEMALES 15-44 YRS.

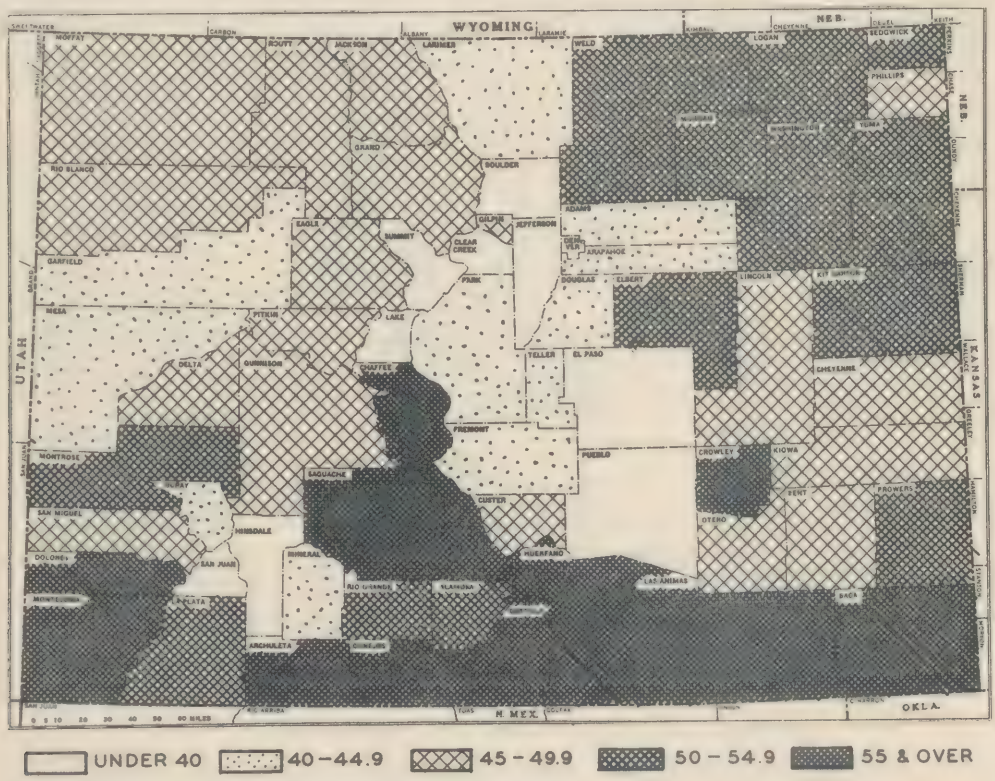
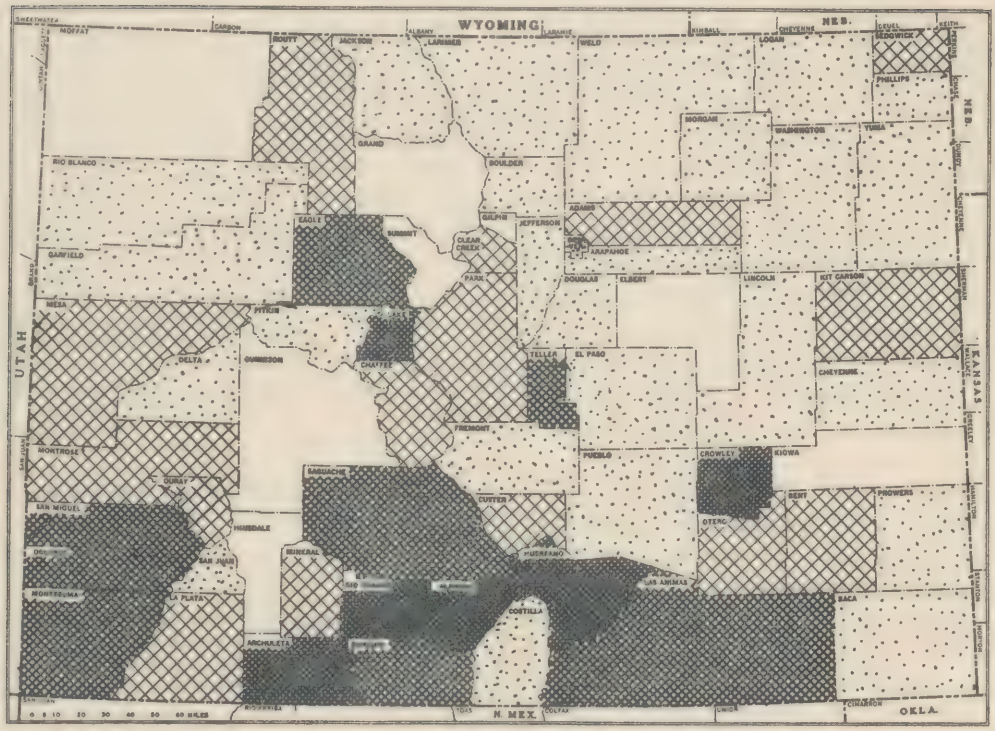


FIGURE X

INFANT MORTALITY – COLORADO 1938
ALLOCATED FOR RESIDENCE



DEATHS UNDER ONE YEAR PER 1,000 LIVE BIRTHS

UNDER 30 | 30 – 59.9 | 60 – 89.9 | 90 – 119.9 | 120 & OVER

GENERAL MORTALITY

The United States Census Bureau reports (see Table VII) indicate that from 1930 to 1938 the Colorado death rates for each year exceeded that for the United States. Over this period there was an annual average in Colorado of more than one death per thousand population than in the United States registration area.

In a previous chapter it was pointed out that Colorado has more of its population in the older age groups, and that the population was growing old faster than the whole United States. This may be one of the reasons for a comparatively high death rate. Another factor to be considered is that the state has long had the reputation throughout the United States of having an ideal climate for those afflicted with tuberculosis and other lung diseases. This has attracted many morbid persons from other states who have made Colorado their permanent residence and have probably increased its mortality rates. Against these factors is the small negro population of Colorado which should have a tendency to decrease the death rate. The state's Mexican population, of which little mortality experience is known, may replace the small negro factor affecting mortality.

The death rates of the separate counties (see Table IX), show a range from 5.9 in Hinsdale County to 25.7 in Lake County. However, the small population on which these rates are based must be considered, especially so in Hinsdale County where a single death will change the rate approximately two deaths per thousand population. Here again the average of several years can not be demonstrated because only one year of residence allocated data is available.

The geographic distribution of mortality rates by counties (see Figure XI), show the highest rates along the Continental Divide about the center of the state, and in the southwest corner in the San Juan valley. The effect of age on the death rates in these areas is apparent by comparing the distribution of the population over 65 years (see Figure VII) with the distribution of high mortality rates. The highest death rates generally coincide with the counties having the greatest portion of old persons in their populations.

In studying the leading causes of death in Colorado in 1938 (see Table VIII), we see that diseases of the heart cause more than twice the number of deaths as cancer, which is the second in frequency.

Little has been accomplished in the study of the causes of heart disease, and consequently health organizations are hindered in planning a preventive program. Some health agencies have attempted to reduce the mortality and morbidity of cardiac diseases but to date no practical results have been reported. The atmospheric conditions

peculiar to the high altitudes of Colorado may contribute to the great number of cardiac deaths in the state.

Since cancer is more common in the older age groups, Colorado should be expected to have a large number of deaths from this cause. If cancer deaths could be standardized for ages, Colorado rates would probably compare favorably with other states. Because of the lack of knowledge of the causes and treatment of cancer, very little has been accomplished in its prevention by health organizations. The high costs of diagnosis and treatment has lead most official health agencies to spend their appropriations on programs that will yield more practical results in reducing mortality. Activities in Cancer Control by the Colorado State Board of Health have been confined to surveys and education of physicians and the public.

Pneumonia is probably the greatest mortality problem of Colorado in which official health agencies can offer a practical control program. The pneumonia death rate for the state, in 1938, was 104.6 per 100,000 population, and the rates of the counties (see Table IX) ranged from no deaths in five counties to a rate of 681.8 in Lake County. The statistical significance of this rate may be justly criticized because it applies to a small population for a single year, but reviewing the last five years mortality records of the county, we find that 124 pneumonia deaths have been reported in a population of about 5,000 persons, which would mean a five year average pneumonia mortality rate of approximately 500 per 100,000 population. The explanation of this unusual rate is probably due to the fact that practically all the population of the county lives at an altitude over 10,000 feet above sea level. The relatively small amount of oxygen in the atmosphere at this altitude embarrasses the already impaired respiration of pneumonia victims and case fatality rates approach 100 per-cent.

All Colorado counties reporting high pneumonia death rates in 1938, are located in the high mountain areas (see Figure XII). The highest rates are concentrated along the high ridge of the Continental Divide, and in the San Luis and San Juan districts in the southwest portion of the state.

In 1938 the Colorado State Board of Health began a pneumonia control program. This program has established 19 pneumonia typing stations at key locations in the state to aid physicians in diagnosis, and is supplying several of the common types of anti-serum and drugs to medically needy victims of the disease. The results of this program have not as yet been appraised but the belief has been expressed by the director of the program that the money expended on this program has been a practical venture in reducing pneumonia mortality.

Accidents occupy a relative high place among the leading causes of death in Colorado in 1938. The State Board of Health at

TABLE VII

ANNUAL DEATH RATES, COLORADO AND UNITED STATES, 1930-1938
FROM UNITED STATES CENSUS BUREAU

YEAR	COLORADO	UNITED STATES
1930	12.7	11.3
1931	11.9	11.1
1932	12.0	10.9
1933	11.4	10.7
1934	11.8	11.0
1935	12.4	10.9
1936	12.8	11.5
1937	12.9	11.2
1938	12.4	10.6

TABLE VIII

TEN LEADING CAUSES OF DEATH, RESIDENCE ALLOCATED, COLORADO, 1938

		NUMBER	RATE PER 100,000 POPULATION
1.	Heart	2688	256.9
2.	Cancer	1315	125.7
3.	Pneumonia	1094	104.6
4.	Accidents	1031	98.5
5.	Cerebral Hemorrhage	938	89.7
6.	Nephritis	918	87.7
7.	Tuberculosis	540	51.6
8	Prematurity	350	33.5
9.	Arteriosclerosis	218	20.8
10.	Appendicitis	197	18.8

TABLE IX

RESIDENCE ALLOCATED MORTALITY AND RATES, COLORADO COUNTIES, 1938

COUNTIES	ALL DEATHS		PNEUMONIA DEATHS		TUBERCULOSIS DEATHS	
	NUMBER	RATE/1,000 POP.	NUMBER	RATE/100,000 POP.	NUMBER	RATE/100,000 POP.
Adams	201	9.5	23	108.9	13	61.6
Alamosa	135	13.6	18	181.0	1	10.0
Arapahoe	261	9.7	17	62.9	19	70.3
Archuleta	32	10.8	3	101.3	--	--
Baca	37	5.3	5	71.7	--	--
Bent	73	9.2	5	62.9	4	50.3
Boulder	429	12.4	29	83.6	12	34.6
Chaffee	107	12.9	11	132.2	2	24.0
Cheyenne	19	7.0	1	36.7	1	36.7
Clear Creek	70	19.4	6	166.5	3	83.3
Conejos	108	10.2	15	141.2	4	37.6
Costilla	42	6.9	4	65.6	1	16.4
Crowley	53	9.3	2	35.0	2	35.0
Custer	27	11.2	5	207.8	--	--
Delta	158	10.8	15	102.7	3	20.5
Denver	3,856	12.9	281	94.1	213	71.4
Dolores	18	10.4	3	173.4	--	--
Douglas	33	9.1	1	27.5	3	82.6
Eagle	52	12.7	5	122.0	1	24.4
Elbert	40	7.5	4	75.1	--	--
El Paso	650	12.8	40	78.7	55	108.2
Fremont	198	10.9	20	109.8	6	32.9
Garfield	108	10.9	8	81.0	3	30.4
Gilpin	20	15.5	3	232.6	1	77.5
Grand	19	7.8	--	--	--	--
Gunnison	58	9.2	8	126.9	2	31.7
Hinsdale	3	5.9	--	--	--	--
Huerfano	198	11.2	21	119.1	11	62.4
Jackson	17	12.8	1	75.4	--	--
Jefferson	307	11.6	24	90.6	13	49.1
Kiowa	21	7.6	2	72.8	--	--
Kit Carson	72	9.6	6	80.2	1	13.4
Lake	128	25.7	34	681.8	--	--
La Plata	153	11.0	30	215.3	4	28.7
Larimer	375	11.2	25	74.4	9	26.8
Las Animas	399	11.1	43	120.5	18	50.3
Lincoln	53	9.8	4	74.1	1	18.5
Logan	146	8.2	14	78.5	1	5.6
Mesa	323	9.9	21	64.2	5	15.3
Mineral	14	21.1	3	453.2	--	--
Moffat	34	7.8	--	--	1	23.0
Montezuma	122	15.4	18	227.9	4	50.7
Montrose	148	11.1	18	133.3	5	37.0
Morgan	162	10.1	11	68.3	8	49.7
Otero	281	11.6	27	111.9	18	74.6
Ouray	42	19.8	2	94.3	2	94.3

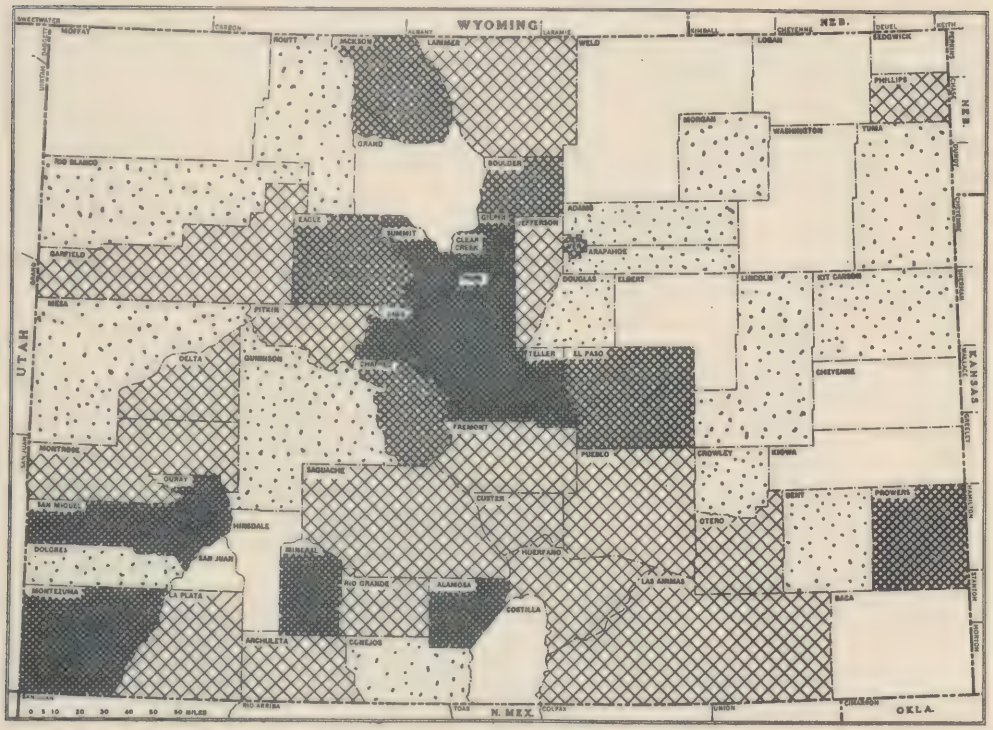
TABLE IX - Continued

RESIDENCE ALLOCATED MORTALITY AND RATES, COLORADO COUNTIES, 1938

COUNTIES	ALL DEATHS		PNEUMONIA DEATHS		TUBERCULOSIS DEATHS	
	NUMBER	RATE/1,000 POP.	NUMBER	RATE/100,000 POP.	NUMBER	RATE/100,000 POP.
Park	45	17.2	5	190.8	1	38.2
Phillips	64	11.5	6	107.6	1	17.9
Pitkin	20	11.6	1	57.8	--	--
Prowers	144	13.0	13	117.8	2	18.1
Pueblo	646	11.0	54	91.9	36	61.3
Rio Blanco	26	9.0	--	--	1	34.8
Rio Grande	153	11.2	37	270.4	8	58.5
Routt	93	9.5	6	61.4	--	--
Saguache	71	11.3	10	160.6	1	15.9
San Juan	17	6.5	1	38.3	1	38.3
San Miguel	35	13.6	6	233.8	1	39.0
Sedgwick	35	7.3	2	41.9	--	--
Summit	20	19.4	2	19.4	--	--
Teller	92	19.8	11	236.3	4	85.9
Washington	62	8.0	1	12.8	1	12.8
Weld	536	8.6	60	96.1	16	25.6
Yuma	107	9.1	8	67.9	1	8.5
Res.Institutions	380	--	35	--	16	--
COLORADO	12,348	11.8	1,094	104.6	540	51.6

FIGURE XI

MORTALITY FROM ALL CAUSES — COLORADO 1938
ALLOCATED FOR RESIDENCE

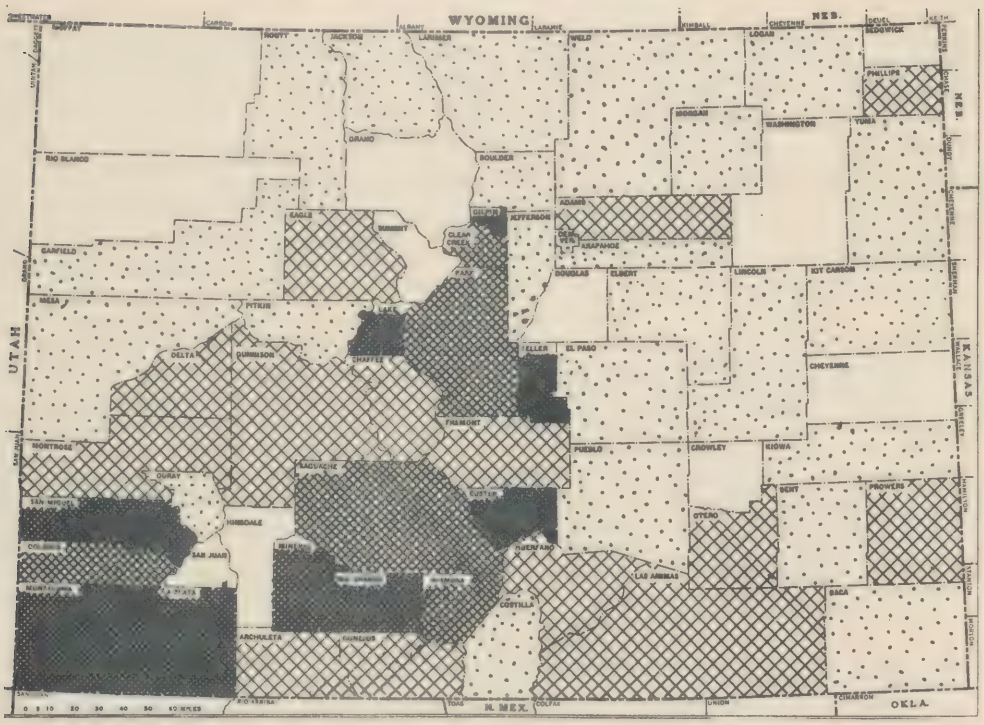


DEATHS PER 1,000 POPULATION

UNDER 9 | 9 — 10.4 | 10.5 — 11.9 | 12 — 13.4 | 13.5 & OVER

FIGURE XII

MORTALITY FROM PNEUMONIA – COLORADO 1938
ALLOCATED FOR RESIDENCE



DEATHS PER 100,000 POPULATION

UNDER 50 | 50 - 99.9 | 100 - 149.9 | 150 - 199.9 | 200 & OVER

present, has no program for the prevention of accidents, yet of all the leading causes of death, accidents present the largest group of unquestionably preventable deaths. The ages at which accidental deaths are most frequent is of interest. The Colorado state registrar reports accidents the leading cause of death in Colorado age groups 2 to 19 years. This would suggest that an accident prevention program could be practically included in child health and school programs through the state.

Tuberculosis has, for many years, been a special problem for the State of Colorado because of the reputation of the effect of its climate on lung diseases. This reputation was probably acquired because of the inhibiting effect of the arid atmosphere on all bacterial growth. This story has been responsible for the immigration of many persons infected with tuberculosis, and considering this, it is remarkable that the tuberculosis death rate for the state, in 1938, is down to 51.6 per 100,000 population.

Fifteen counties of the state representing approximately, 50,000 population report no deaths during 1938, (see Table IX), and 11 more counties have a rate less than 20 per 100,000 population. Twelve counties have a rate greater than 60, the highest rate being 108.2 in El Paso County. The counties having tuberculosis death rates over 60 are all along the eastern foothills of the Continental Divide (see Figure XIII) with the exception of Ouray County. These counties with high rates correspond generally to those with the highest concentration of population (see Figure IV).

The Colorado State Board of Health, recognizing the problem of this disease in the state, has since 1936 employed a full time director of Tuberculosis Control. The work of this division has consisted of tuberculin testing, physicial examinations, X-ray, and education. The state does not maintain hospitals for the isolation and treatment of tuberculosis patients, but does appropriate $50,000 annually thru the Welfare Department to match local funds spent for hospitalization in the many privately owned tuberculosis hospitals in the state.

Prematurity is recorded as one of the ten leading causes of death in 1938, but this group has been shown by Bundenson (12) to generally include many deaths due to other causes. Regardless of the true cause of death, they do represent a group that preventive medical procedures can reduce with adequate programs. The Colorado State Board of Health is attempting to reduce all infant and maternal mortality through the Division of Maternal and Child Health. Programs now directed especially at this cause of death consist mainly of prenatal clinics, obstetrical home nursing, and the use of portable incubators in rural areas.

Cerebral hemorrhage, nephritis, arterio-sclerosis, and appendicitis are all included among the ten most common causes of death in Colorado, in 1938, but because of the little knowledge of the etiology and prevention of these diseases Colorado, as most other states, has been unable to suggest any practical program that might reduce these causes of death.

COMMUNICABLE DISEASES

The case reports of communicable diseases depend entirely on the practicing physicians. If they are faithful in their reporting, the resulting statistics present a true picture of disease incidence of a community, and if they are negligent the picture is distorted. The efficiency of the physicians can not be measured, but it is reasonable to suppose that in every part of the United States many cases of communicable disease are never reported. In interpreting health department reports, then we should not consider the number of reported cases as a true picture of morbidity but rather an index of morbidity. The real value of these statistics is in the rise and fall through consecutive seasons and years, rather than the total number of cases recorded for any given period.

The trends of reportable diseases rates in Colorado compared to the United States from 1930 to 1938 (see Table X and Figure XIV) indicate that the most important disease problems of the state are typhoid, smallpox and diphtheria. The other diseases seem to have followed the same trends in both areas. In the case of Syphilis, it is interesting to note that the trends are the same in both areas, but in the United States there has been a report rate double that of Colorado through all of the years observed.

Reports of communicable disease per death, in 1938, compared to the standards of the appraisal schedule of the American Public Health Association are as follows:

Disease	Colorado Reports per death	Expected Reports per death
Measles	269	150
Scarlet Fever	131	150
Whooping Cough	50	37
Diphtheria	13	15
Typhoid Fever	8	7

This would indicate that physicians report well on typhoid fever, measles, and whooping cough, but should do better on scarlet fever and diphtheria.

FIGURE XIII

MORTALITY FROM TUBERCULOSIS (ALL FORMS) – COLORADO 1938
ALLOCATED FOR RESIDENCE

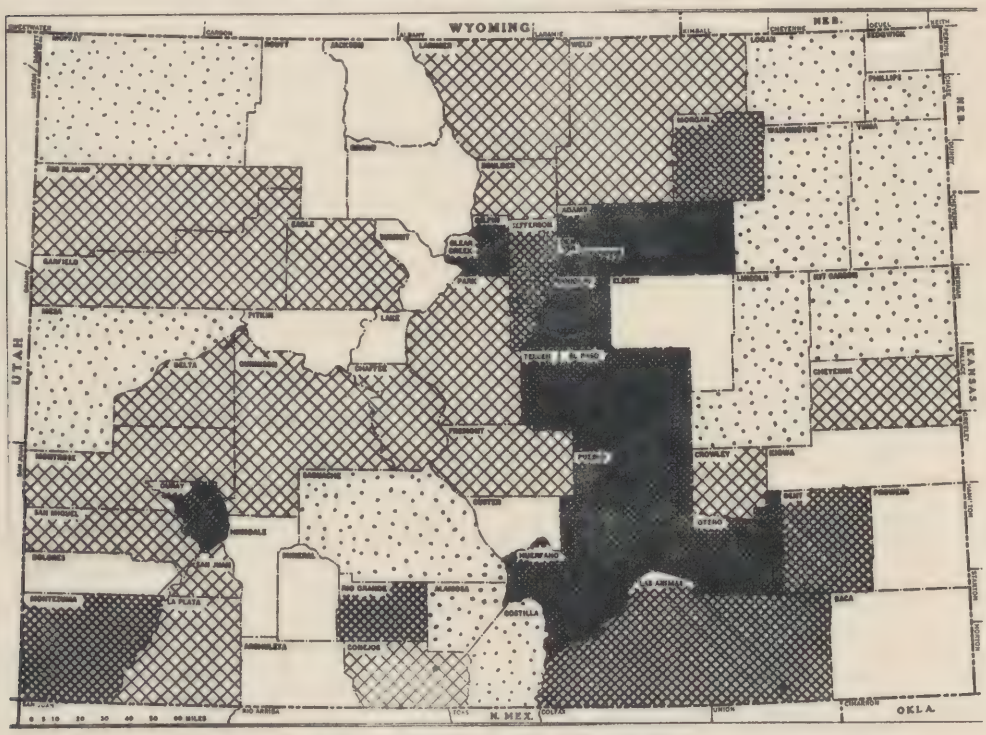


TABLE X

COMMUNICABLE DISEASE REPORT RATES PER 100,000 POPULATION
COLORADO AND UNITED STATES, 1930-1938

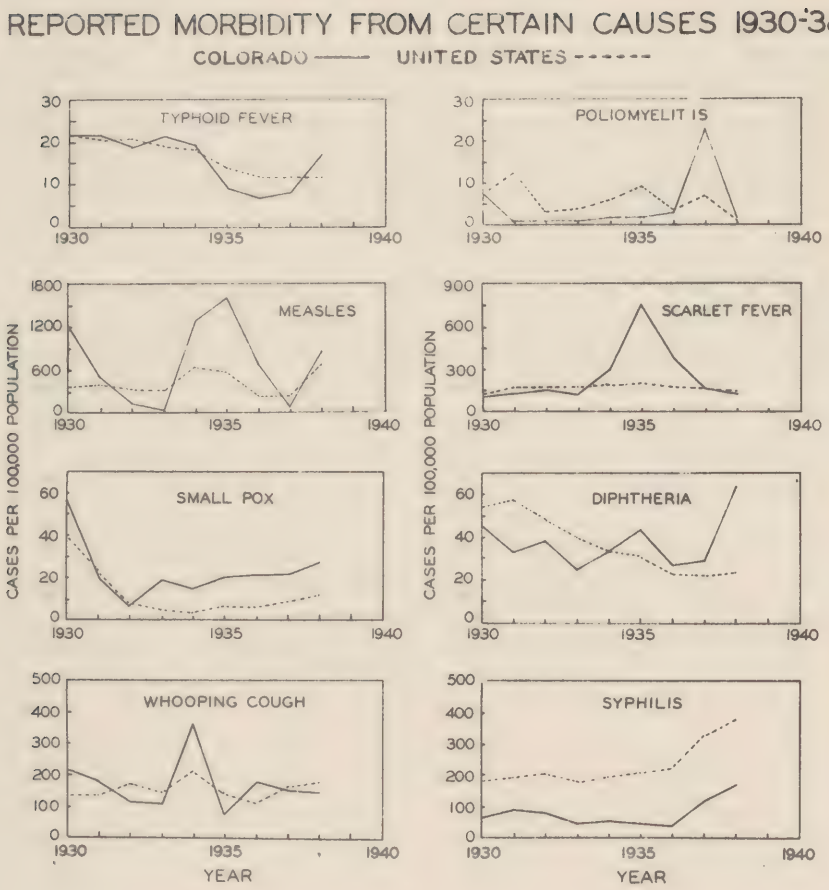
COLORADO

	1930	1931	1932	1933	1934	1935	1936	1937	1938
Diphtheria	45	33	37	25	33	44	27	29	64
Measles	1189	469	191	36	1278	1619	661	114	850
Poliomyelitis	7.3	0.9	0.9	0.7	2.0	2.1	3.1	22.8	1.2
Scarlet Fever	108	138	153	126	296	750	373	153	176
Smallpox	56	22	8	19	15	20	21	21	27
Syphilis	61	88	72	42	56	43	39	114	163
Typhoid & Paratyphoid	22	22	18	22	19	10	7	8	17
Whooping Cough	218	187	125	116	361	73	171	160	153

UNITED STATES

Diphtheria	54	57	48	40	34	31	23	22	24
Measles	340	382	323	319	631	583	233	249	641
Poliomyelitis	7.6	12.7	3.0	4.0	5.9	9.0	3.5	7.0	1.3
Scarlet Fever	141	162	168	169	174	205	190	177	148
Smallpox	40	24	9	5	4	6	6	9	12
Syphilis	180	193	202	175	192	207	224	330	371
Typhoid & Paratyphoid	22	21	21	19	18	14	12	12	12
Whooping Cough	135	136	171	143	209	142	115	166	177

FIGURE XIV


REPORTED MORBIDITY FROM CERTAIN CAUSES 1930-38
COLORADO —— UNITED STATES ------
TYPHOID FEVER
POLIOMYELITIS
MEASLES
SCARLET FEVER
SMALL POX
DIPHTHERIA
WHOOPING COUGH
SYPHILIS
CASES PER 100,000 POPULATION
YEAR
1930
1935
1940

From 1930 to 1936 typhoid fever has shown a downward trend in Colorado, following closely the United States reports. From 1936 to 1938 there is a sharply increasing report rate in Colorado while the United States trend continues downward. This sharp rise may be due to better epidemiological work and a more complete knowledge of where the cases are occurring.

Since 1934 smallpox has been consistently reported in Colorado at a frequency about twice that of the United States. The increase occurred two years before the Social Security Act stimulated local health work and consequently the high rate can not be attributed to better reporting or better epidemiological work. The high incidence can more properly be charged to lack of widespread vaccination.

Colorado diphtheria reports from 1930 to 1937 have remained at about the same level, while during the same period United States reports have been consistently reduced. In 1938, while the United States reports remained at about the same rate, Colorado reports doubled those of 1937. Since diphtheria is a definitely preventable disease, this would indicate that local health authorities of Colorado are doing a very poor job of protecting its people against this disease.

Whether or not the reporting of these diseases is complete is not as important as the fact that preventable diseases are definitely endemic in the state and it is the duty of the Colorado State Board of Health to attempt to reduce these diseases through its own action, or by the stimulation of local health authorities.

CHAPTER V

HEALTH AND HOSPITAL FACILITIES

HOSPITALS

The many hospital studies available agree that adequate facilities depend on many factors which vary widely in each community. Race, age, sex, morbidity, topography, climate, industry, and many other factors must be considered in attempting to determine the number of beds or type of service desirable for any given community. Due to the wide variability of the determining factors, it is obviously not wise to designate the hospital facilities of any area as adequate on a single factor such as population or air line distances.

The urban hospitals of Colorado are probably reasonably adequate. The real hospital problem is in the rural areas, especially where the population is widely scattered.

Detailed studies of the factors involved in developing adequate hospital facilities for the sparsely settled mountain communities, are not available, but a recent study of a rural New York hospital service (13) revealed the following:

1. A relatively large portion of the population under 15 years of age is hospitalized.

2. The female population between 15 and 35 years show the highest hospital rate.

3. The predominating occupations of those admitted are housewives, students and infants.

4. The leading primary diagnoses are trauma, pregnancy, and newborn infants.

5. Diseases requiring skilled treatments lead in causes.

6. The most common surgical conditions are appendicitis, cholecystitis and salpingitis.

7. Ninety-four per-cent of patients come from within a 30 mile radius.

8. Thirty-eight per-cent of the accidents are from highways, 19 per-cent from homes, and 18 per-cent from farms.

9. Fifty-two per-cent of the patients require less than one hour ride to the hospital.

10. Twenty-three per-cent of the bills are uncollected.

Comparing the above findings to Colorado, the age, sex, occupation, and diagnosis figures might apply, but not those of distances and travel time. The population of the rural portions of the state is so scattered that it would not be practical to establish hospitals serving areas having radii of 30 miles or less. In some parts of Colorado such areas would have populations of less than 1,500 persons (see Table II), and if three beds per thousand population are sufficient for adequate rural service, theoretically, a five bed hospital would adequately serve any such community. A hospital twice this size is not a practical investment because the expensive equipment necessary for complete service would find little use among such a small group of patients, and the few physicians making use of such facilities could not confine themselves to any specialty. Medical practice in sparsely settled communities must be left entirely to the general practitioner.

Title XII of the Wagner Bill (14) now being considered by Congress suggests grants-in-aid to states for hospitals and health centers. Mustard (13) has said that the rural "hospital regards itself as an instrument in maintaining the public health and, as a corollary, considers the matter of public health of serious concern to itself." This suggests the possibility, in future plans, of establishing combined nursing homes and health centers at convenient intervals in sparsely settled areas. Such a center could be used by health workers for well baby conferences, tuberculosis clinics, and all other preventive medical services. It could also provide facilities for obstetrical care, minor surgery, and general medical care. Ambulance service to hospitals equipped for expensive diagnostic facilities and major surgery, could be provided. Such a plan would serve several purposes, it would:

1. Provide sterile materials for the use of general practitioners.

2. Provide good nursing care for otherwise isolated patients.

3. Provide the rural physician with a close contact and better understanding of the exact function of the health department.

4. Provide the public health field worker with the consultation and advice of the practicing physician.

A complete study of present Colorado hospital facilities is beyond the scope of this thesis, but an attempt will be made to indicate the distribution of the present hospitals and the number of beds available to the population.

Because of the sparse population of some Colorado counties, it is not practical to consider service within the separate counties. Hence, the state is divided into seven districts based primarily on the natural topographical divisions. The sites of hospital facilities are indicated and the state is divided into the following districts: (see Figure XV)

1. Denver city and county.
2. The Platte river valley.
3. The eastern central plains area.
4. The Arkansas river valley.
5. The San Juan and San Luis valleys.
6. The Colorado river valley.
7. The White and Yampa river valleys.

Reference to preceding chapters indicates that transportation facilities, population, race, mortality, natality, and other factors divide the state into these natural divisions.

The American Medical Association (15) reports that in 1938, Colorado had 101 hospitals and related institutions containing 13,433 beds, and 24 hospitals of unknown size that have refused registration. The state has only one hospital specializing in maternity, 15 specializing in tuberculosis, none of which are owned and operated by the state or local governments, and 69 general hospitals. In 1938 Colorado hospitals admitted 95.57 persons per thousand population. Of these 91.38 per thousand were admitted to general hospitals, 2.47 to nervous and mental hospitals, .39 to industrial hospitals and .30 to maternity hospitals.

A study of the general beds available to Colorado residents within the separate counties (see Figure XV) shows there are 30 counties without hospitals, 12 counties with less than three beds per thousand population, 12 counties with three to six beds per thousand, 6 counties with 6 to 9 beds per thousand, and three counties with more than 9 beds per thousand. The three counties with more than 9 beds per thousand are in mining districts where hospital needs are greatest because of the hazardous occupations. The lack of hospital facilities is most prominent in the northwest corner of the state.

Considering the hospital facilities on the basis of topographical districts (see Table XI) we find. in Denver, the largest number of beds, the largest number of beds per population, and the largest hospitals.

FIGURE XV

DISTRIBUTION OF HOSPITAL FACILITIES - COLORADO, 1938

FROM AMERICAN MEDICAL ASSOCIATION

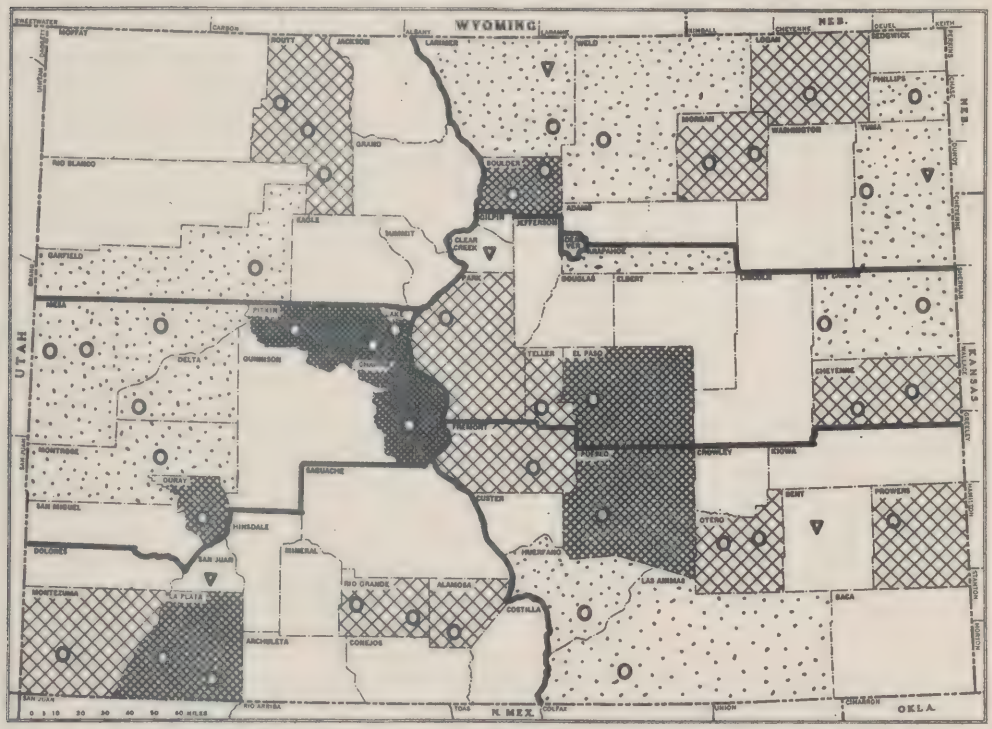


TABLE XI

GENERAL HOSPITAL FACILITIES AND PHYSICIANS, COLORADO, 1938

District	Hospitals				Physicians		Per-cent of Births in Registered Hospitals
	Number	Total Beds	Median No. Beds	Beds per 1000 Pop.	Number	Pop. Per Physician	
Denver	11	2120	160	7.1	748	399	91.6
Platte Valley	14	535	32	2.5	231	934	28.3
East Central	8	453	20	3.2	192	735	50.8
Arkansas Valley	9	691	50	3.6	194	986	32.8
San Luis-San Juan Valley	10	279	27	3.6	70	1,099	31.4
Colorado Valley	12	330	18	3.8	86	1,010	29.6
White-Yampa Valley	5	69	11	1.9	41	872	21.2

Most of the specialists have located in Denver, Pueblo, and Colorado Springs and their services attract many patients from all over Colorado and several of the adjoining states. The hospital census (see Table XI) indicates that Denver has 7.1 beds per thousand population, but these beds are not all used by Denver residents, except those of Denver General Hospital. A survey of the 1938 admissions to three general hospitals (Presbyterian 150 beds; St. Anthony, 154 beds; St. Lukes, 219 beds) representing approximately 25 per-cent of the general hospital beds in the city, reveals that 42.6 per-cent of the admissions are from outside the city. If we apply this rate to all Denver hospitals except Denver General, then we can estimate that approximately 1450 (68 per-cent) of Denver's general hospital beds are used by its residents. On this basis there would be 4.9 beds per thousand population in Denver actually available to its residents. The remaining districts of the state, with the exception of the White and Yampa river valleys, show from 2.5 to 3.8 beds per thousand available. In the usual rural communities this would be considered adequate but since some parts of these districts have a large proportion of the population employed in mines the present facilities may not be adequate. This question can be settled only by careful local surveys.

The greatest need in the state is indicated in the White and Yampa river valleys. In this district there are only five hospitals, the largest having 21 beds. Transportation facilities make Denver the nearest place where these patients may find adequate diagnostic facilities and the services of specialists. The most distant point in the district is approximately 240 miles air line and much farther by road to Denver.

Hospital admissions to general beds are difficult to determine for Colorado because many of the general hospitals have part of their beds for tuberculosis patients, and the admissions to tuberculosis and general beds are difficult to separate. Thus the only available data to use as an index of the use made of hospitals by the people of Colorado, are the hospital confinements. The data used here (see Table XI) are the number of births recorded in registered hospitals, and the per-cent is based on the total number of births recorded. In interpreting the figures one must bear in mind that the final figures do not show the per-cent of mothers in a district who sought hospital care, but do indicate where they sought it. In Denver, 91.6 per-cent of the recorded births occurred in registered hospitals, while the Colorado state registrar of vital statistics reports that 15.5 per-cent of the recorded births were allocated out of the city, and 77.0 per-cent of the resident births were hospital deliveries. This should not lead us to the conclusion that such a high per-cent of Denver residents were able to have hospital care, but rather, that many mothers from other parts of the state came to Denver for their confinements because they preferred the best available hospital service and medical care.

The picture of hospital confinements in other parts of the state (see Table XI) is probably somewhat distorted because quite a number of confinements were conducted in small unregistered hospitals, so actually more mothers, not residents of Denver, received hospital care than the data show. It must be remembered too, that by using the recorded births we are not considering those mothers who left the district in seeking better service. It is interesting to note in the White and Yampa river valleys that 21.2 per-cent of the mothers who remained in the district sought hospital care in spite of the lack of satisfactory facilities available.

A study of the above data would suggest that more hospital confinements could occur in Colorado hospitals, outside of Denver, if better facilities were available and the number would undoubtedly be increased by the use of some plan whereby those of the lower income classes would be able to meet the costs of such service.

PHYSICIANS

In recent years the conduct of medical practice has been severely criticised by some laymen who do not believe the physicians have tried to keep pace with the changing world in administering medical services. The physicians on the other hand have attempted to preserve a code of ethics supported by more than 2,000 years of tradition. This problem has become increasingly complex in the past few years by the introduction of many improved and expensive diagnostic and treatment facilities which the physician finds he is unable to use because his patients are not able to pay for them.

The writer, having practiced medicine for approximately 10 years, is fully aware of the helpless feeling of the physician who makes endless calls on a patient, knowing that if the patient could afford hospital care, expensive diagnostic procedures, and treatment, he could soon be returned to good health. This situation is not the fault of the physician, nor can the patient be blamed for his limited earning capacity.

Laymen, not knowing the problems of the physicians, have attempted to solve the problems of medical practice through legislation and governmental group activities without perhaps seeking the proper consultation of the physicians. This has resulted in forcing some physicians to practice medicine under a condition which they resent, and has made many other physicians suspicious of any activity in the medical field by the Federal Government. Meanwhile, in some quarters the rank and file of physicians have not studied the problems nor read reports which describe all aspects of the situation.

A stated amount of medical care can not be considered adequate for all communities. The needs depend on factors that vary in each local

situation, and the individuals experiencing those needs should be the ones best qualified to express them. Recognizing medical care and public health as purely local problems, the Social Security Act and the proposed Wagner Bill allot grants-in-aid to the separate states, on the basis of their needs, in order that they may spend their allotment on programs best suited to their own problems.

In Colorado, these grants are handled through the state board of health by physicians with medical and administrative training. In 1938, the state medical society, representing 1,088 members among Colorado's 1,562 registered resident physicians, had adopted an advisory system to aid the state board of health in administering their program. Under this system the society has appointed committees from its membership, on cancer, tuberculosis, venereal disease, pneumonia, maternal and child health, crippled children, industrial health, and milk. These committees act in an advisory capacity to the division directors of the state board of health, assisting the directors in shaping their programs and policies to meet the needs of the practicing physicians and their patients. The chairman of each of these committees make up a committee on public health, acting in a general advisory capacity to the state board of health.

There has been a growing tendency in the United States toward group practice. Under such a system a group of physicians pool their services, equipment, office space, and in many cases their income. At the same time they are able to reduce expenses, hire skilled personnel, and use equipment which they could not afford in individual practice; and the patient can be offered better diagnostic facilities and his costs may be somewhat reduced in proportion to the service he receives. At the close of 1938, four such plans were in operation in Colorado, located at Greeley, Pueblo (two groups), and Denver.

Group schemes are applicable only to well populated centers that can support several doctors. This eliminates a large part of Colorado from such plans because of its scattered population. In future plans of rural hospital development, it may be well to keep in mind the possibility of using these hospitals as the nuclei for group practice.

In a large proportion of American families, costly illness has become a financial catastrophe, and for this reason many plans for spreading the cost of medical care have been tried. The tax plan used by many foreign countries is not applicable to the United States, and so all of our American plans have been based on voluntary prepayment. This system consists of the pooling of monthly payments by a large group to pay for the medical care of the members of that group suffering any illness. Prepayment plans have been sponsored in the United States by physicians, patients, other persons or groups, and by the government.

There are only three physician sponsored prepayment plans in Colorado. Two of these are located in Denver and one in Greeley. All are relatively recent and no information is available on their progress.

No known patient sponsored prepayment plans have been operating in the state.

Two ventures in prepayment plans by Denver insurance companies have failed, but several large insurance companies operating in the state are now conducting a prepayment plan on a reimbursement basis.

The only government prepayment plan operating in Colorado, has been that sponsored by the Farm Security Administration. This plan, in most places has been very unsatisfactory to the physicians because the government representatives attempt to determine the fees. In some cases the fees have been only 20 per-cent of the usual charges by the physicians, and the physicians have stated that they would rather do the work free (16).

Physicians in rural practice find it extremely difficult to leave their practice to obtain post-graduate training and become acquainted with new methods in medical practice. To aid such physicians, the Colorado State Medical Society has sponsored post-graduate clinics and visiting symposium teams.

Each year, three day post-graduate clinical conferences are held in Denver, Pueblo, and Grand Junction. Physicians of national reputation supervise the clinics, and the expenses are borne by the state and county societies, a two dollar fee from attending physicians, and some financial aid from the Colorado State Board of Health. In 1938, 610 Colorado physicians attended these clinics.

The symposium teams are made up of physicians interested in cancer, venereal disease, pneumonia, and tuberculosis. These teams visit any local medical society in the state, on invitation, and direct discussions on their chosen subject. Travel expenses of these teams have been financed by the Women's Field Army, The American Society for the Control of Cancer, The State Tuberculosis Association, The Colorado State Board of Health, and the Colorado State Medical Society. The physicians have generously donated their time and the symposia have been given to the local societies at no cost to them. In 1938, approximately 400 Colorado physicians attended these symposia.

The American Medical Association reports 1,923 physicians in Colorado in 1938 (17). Based on their Colorado population estimate of 1,069,000 for 1937, this would be one physician for each 556 persons in the state. The source of the physicians census and the day of the year that it was taken is not indicated.

From the annual report of the Colorado State Board of Medical Examiners, as of December 31, 1938, there were 1,562 resident physicians licensed in the state (see Table XII). Based on the population estimates in Table I, there would be one physician for each 670 persons in the state.

The American Medical Association has pointed out that physicians tend to concentrate in the large communities where hospital facilities and educational opportunities are best (18). This is well illustrated by Denver having one physician for each 399 population, the highest physician concentration in the state (see Table XII). Gilpin and Hinsdale counties have no physicians and their populations are 1,290 and 511 persons respectively, but medical services are supplied to these counties by the physicians located in adjacent counties. Since the practice of many Colorado physicians extends over several counties, the population per physician in each county, which ranges from 399 to 2,639; is not a true measure of the county's medical facilities.

Considering the physician distribution by districts, outside of Denver, we find the population per physician ranging from 735 to 1,099 (see Table XI). It is noted that the poorest distribution of physicians is in the San Luis, San Juan, and Colorado river valleys. This suggests the medical services might be least adequate in these districts, because all of this area has scattered population and poor transportation facilities and much of the physician's time must be taken up in travel.

OSTEOPATHIC PHYSICIANS

Doctors of osteopathy are licensed in Colorado by the State Board of Medical Examiners and are granted the same privilege of practice as doctors of medicine. At several places in the state they have established hospitals for medical, surgical, and obstetrical care of their patients. There are 180 (see Table XII) osteopathic physicians registered in the state, and their mutual consideration for the doctors of medicine is illustrated by the agreement on policies (19) between the State Medical Society, and the State Osteopathic Physicians Society. Osteopathic physicians have approved the policies of the state board of health and have aided indirectly in the administration of local health activities.

MIDWIVES

Midwives attend a very small number of Colorado births. In 1930, there were 25 midwives registered in the state, 21 in 1934, and 21 in 1938. Of the 21 registered in 1938, (see Table XII) 11 were in Denver, two in Pueblo and not more than one was registered in any of the other counties.

NURSES

Public Health Nursing probably had its beginning in Colorado when, after the Armistice in 1918, some of the Red Cross Chapters used left over war funds to pay a few nurses for preventive services in contrast to the pre-war methods of nursing the sick poor. Funds were soon exhausted and preventive nursing service was curtailed until 1922 when the Sheppard-Towner Act provided funds for Maternal and Infant Welfare. With this federal aid, a traveling Child Clinic visited a large part of the state. Later, some nursing was provided by the Federal Relief Administration.

In 1936 when Social Security funds were allotted to the Colorado State Board of Health, an official state public health nursing division was established. During the first year of its existence, 35 official Public Health Nurses were placed in counties, and 26 nurses were sent to training centers for special public health training. The first six nurses were placed in counties where the greatest maternal and child problems were indicated, and the other nurses were placed in areas where the citizens requested such service. By the end of 1938, 72 official nurses were assigned to local health work throughout the state, 58 nurses were employed by voluntary health agencies, and 39 nurses were employed by Colorado schools.

No detailed study of the public health nursing needs of the state has ever been made, consequently the present distribution of nursing service is the result of public interest within the local communities rather than the actual need for such services. This has resulted in a fairly even distribution on a population basis. (see Figure XVI). The question arises here as to whether or not a better attack might be made on the health problems of the state by concentration of efforts in those areas where need is most important. Such areas may not coincide with the areas of greatest interest in the service, but might it not be more practical to invest public health funds in awakening a community with difficult health problems and lagging interest in them, rather than in an alert community with high ideals and minimal problems?

Establishing a basis for the distribution of nursing service is difficult. Most authorities on the subject select population as the factor for distribution, and various authors designate from 1,500 to 5,000 persons per nurse as an adequate public health service. If we consider as adequate, the often quoted figure of one nurse per 3,000 population, and apply this to Colorado counties (see Table XIII), we find that only three counties, Cheyenne, Grand, and Rio Blanco have such concentration of service (see Figure XVII). The three counties referred to have a total area of 6,866 square miles which exceeds the area of the state of Connecticut, and one of them, Rio Blanco County has an area approximately half that of Connecticut. A single nurse attempting to

TABLE XII

DISTRIBUTION OF PHYSICIANS AND MIDWIVES, COLORADO, 1938

County	Midwives	Osteopathic Physicians	Doctors of Medicine	Population Per M.D.
Adams	0	1	8	2,639
Alamosa	0	3	12	829
Arapahoe	0	2	16	1,690
Archuleta	0	0	2	1,481
Baca	1	0	4	1,744
Bent	0	0	6	1,325
Boulder	1	14	54	643
Chaffee	0	0	10	832
Cheyenne	0	0	2	1,363
Clear Creek	0	0	3	1,201
Conejos	0	0	6	1,771
Costilla	0	0	3	2,032
Crowley	0	0	4	1,428
Custer	0	1	1	2,406
Delta	0	3	16	913
Denver	11	76	748	399
Dolores	0	0	2	865
Douglas	0	0	4	908
Eagle	0	0	4	1,024
Elbert	0	1	5	1,064
El Paso	1	9	121	421
Fremont	0	6	23	792
Garfield	0	3	12	823
Gilpin	0	0	0	---
Grand	0	1	3	808
Gunnison	0	0	7	901
Hinsdale	0	0	0	---
Huerfano	0	0	11	1,603
Jackson	0	1	1	1,327
Jefferson	0	3	19	1,394
Kiowa	1	0	2	1,374
Kit Carson	0	0	7	1,608
Lake	0	1	6	831
La Plata	1	1	16	871
Larimer	0	11	44	764
Las Animas	1	1	20	1,790
Lincoln	0	1	7	771
Logan	0	3	16	1,114
Mesa	1	9	27	1,212
Mineral	0	0	0	662
Moffat	0	0	4	1,087
Montezuma	0	1	10	790
Montrose	0	2	14	965
Morgan	0	4	15	1,073
Otero	0	4	24	1,005
Ouray	0	0	2	1,060

TABLE XII - Continued

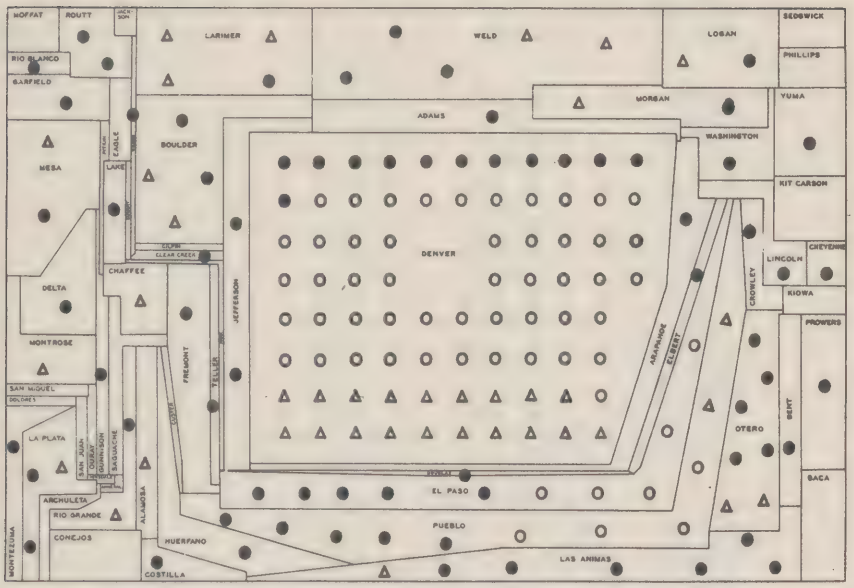
DISTRIBUTION OF PHYSICIANS AND MIDWIVES, COLORADO, 1938

County	Midwives	Osteopathic Physicians	Doctors of Medicine	Population Per M.D.
Park	0	0	2	1,310
Phillips	0	1	6	929
Pitkin	0	0	1	1,731
Prowers	0	0	11	1,004
Pueblo	2	3	88	668
Rio Blanco	0	1	3	958
Rio Grande	0	2	10	1,368
Routt	0	1	12	756
Saguache	0	1	5	1,258
San Juan	0	0	3	869
San Miguel	0	0	3	855
Sedgwick	0	1	2	2,384
Summit	0	0	2	515
Teller	0	0	6	776
Washington	0	0	6	1,299
Weld	0	8	71	880
Yuma	1	0	9	1,310
COLORADO	21	180	1,562	670

FIGURE XVI

STATE OF COLORADO

WITH COUNTY AREAS REPRESENTING POPULATION OF 1930



DISTRIBUTION OF NURSES — COLORADO 1938

●-OFFICIAL ○-VOLUNTARY △-SCHOOL

TABLE XIII

PUBLIC HEALTH NURSES, COLORADO, 1938

County	Official	Voluntary	School	Pop. Per Nurse	Sq. Miles Per Nurse
Adams	1	0	0	21,115	1,262
Alamosa	0	0	1	9,943	727
Arapahoe	1	0	0	27,041	842
Archuleta	0	0	0	---	---
Baca	0	0	0	---	---
Bent	1	0	0	7,950	1,524
Boulder	2	0	2	8,674	191
Chaffee	0	0	1	8,320	1,083
Cheyenne	1	0	0	2,727	1,777
Clear Creek	1	0	0	3,603	390
Conejos	0	0	0	---	---
Costilla	1	0	0	6,096	1,185
Crowley	1	0	0	5,712	808
Custer	0	0	0	---	---
Delta	1	0	0	14,602	1,201
Denver	12	49	19	3,731	0.73
Dolores	0	0	0	---	---
Douglas	1	0	0	3,631	845
Eagle	0	0	0	---	---
Elbert	1	0	0	5,323	1,857
El Paso	5	5	0	5,081	212
Fremont	1	0	0	18,216	1,557
Garfield	1	0	0	9,879	3,107
Gilpin	0	0	0	---	---
Grand	1	0	0	2,423	1,866
Gunnison	1	0	0	6,306	3,179
Hinsdale	0	0	0	---	---
Huerfano	1	0	0	17,630	1,500
Jackson	0	0	0	---	---
Jefferson	2	0	0	13,238	404
Kiowa	0	0	0	---	---
Kit Carson	0	0	0	---	---
Lake	1	0	0	4,987	371
La Plata	2	0	1	4,645	617
Larimer	1	0	3	8,400	876
Las Animas	6	0	1	5,114	687
Lincoln	1	0	0	5,400	2,570
Logan	1	0	1	8,912	911
Mesa	1	0	1	16,361	1,581
Mineral	0	0	0	---	---
Moffat	0	0	0	---	---
Montezuma	1	0	0	7,897	2,051
Montrose	0	0	1	13,503	2,264
Morgan	1	0	1	8,050	643
Otero	5	0	2	3,447	180
Ouray	0	0	0	---	---

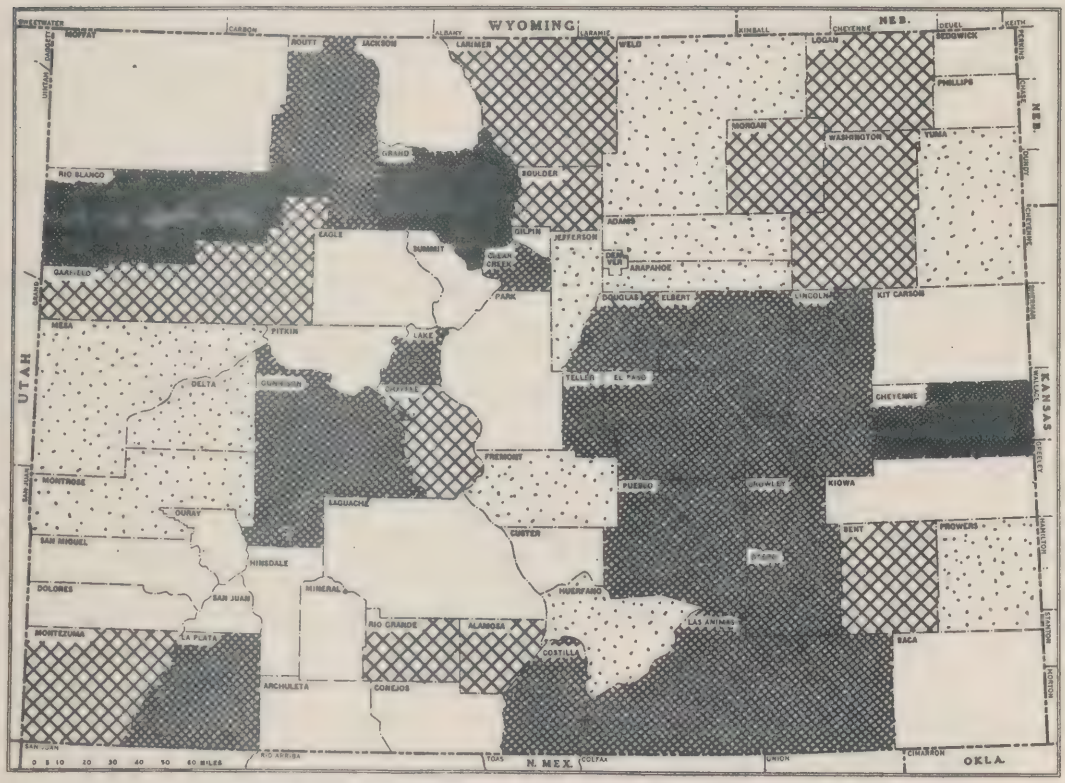
TABLE XIII - Continued

PUBLIC HEALTH NURSES, COLORADO, 1938

County	Official	Voluntary	School	Pop. Per Nurse	Sq. Miles Per Nurse
Park	0	0	0	---	---
Phillips	0	0	0	---	---
Pitkin	0	0	0	---	---
Prowers	1	0	0	11,039	1,630
Pueblo	5	4	2	5,342	221
Rio Blanco	1	0	0	2,875	3,223
Rio Grande	1	0	1	6,842	449
Routt	2	0	0	4,886	1,155
Saguache	0	0	0	---	---
San Juan	0	0	0	---	---
San Miguel	0	0	0	---	---
Sedgwick	0	0	0	---	---
Summit	0	0	0	---	---
Teller	1	0	0	4,655	547
Washington	1	0	0	7,791	2,521
Weld	3	0	2	12,492	804
Yuma	1	0	0	11,789	2,367
COLORADO	72	58	39	6,154	610

FIGURE XVII

POPULATION PER PUBLIC HEALTH NURSE-COLORADO 1938



extend public health services to a population of 2,875 persons distributed over an area of 3,223 square miles would be expected to spend an unusually large part of her working time in travel. An inspection of the Rio Blanco County nurse's time distribution shows that she spends approximately 18 per-cent of her working time in travel. This would not be considered excessive in the average rural community where the population is more concentrated, and would suggest that a nurse working under such circumstances has a tendency to concentrate her services among those persons who are reached with less travel. It must then be assumed that a public health nurse can not adequately meet the needs of a population of 3,000 persons if they are distributed over too large an area.

Sixteen counties of the state, exclusive of Denver, had one public health nurse for each 6,000 population or less in 1938. Of these 16 counties, six had an area of more than 1,000 square miles. (see Table XIII), and five had an area between 500 and 1,000 square miles. Of the 42 Colorado counties having nursing service in 1938, three counties had areas exceeding 3,000 square miles per nurse, five counties had from 2,000 to 3,000 square miles per nurse, 13 counties had from 1,000 to 2,000 square miles per nurse, and 20 counties had less than 1,000 square miles per nurse.

In 1938, public health nursing service throughout the state were administered by 72 official agency nurses. Forty-seven of the nurses employed by official agencies were under the jurisdiction of the advisory service of the State Board of Health, Division of Public Health Nursing. This group recorded 31,344 field visits divided into the following services:

	NO. VISITS	PER-CENT OF VISITS
Communicable Disease	3,287	10.49
Venereal Disease	624	1.99
Tuberculosis	1,626	5.19
Maternity	7,767	24.78
Infant	6,455	20.59
Preschool	2,574	8.21
School	4,446	14.18
Morbidity	3,228	10.30
Crippled Children	1,337	4.27
Total	31,344	100.00

These nurses averaged 647 field visits per nurse annually, and time studies indicate that 30 per-cent of the nurses total time was spent in field visits. The average length of field visits would be approximately 50 minutes and if we assume 275 working days per year per nurse, then each nurse would average approximately 2½ field visits per day.

The length and volume of nursing services are easily measured and appraised, but no satisfactory method of measuring the quality of the services has been devised. The only present measure of the quality of service is the opinion of advisory or supervisory personnel from which personal equations can not be separated.

With its special problems of population concentration, the nursing service of the state can not be determined on the basis of population or area served. Each county seems to present individual problems of health service needs and if one were to set an ideal goal of nursing service, it must be on the basis of detailed studies of the needed service in each community. In a later chapter, nursing services on the basis of community needs will be discussed.

STATE BOARD OF HEALTH

Before Social Security funds were granted to the State Board of Health, health services in the state were very limited. Little health work was accomplished in the state, other than the care of routine office matters carried on by a very small personnel. Since 1936, with federal aid, the work of the board has expanded rapidly. A comparison of the technical personnel employed the year before federal assistance, and three years later, shows the following:

	1935	1938
Physicians	1	4
Nurses	0	4
Social Workers	0	5
Engineers	1	2
Sanitary Officers	2	10
Statistician	1	2
Bacteriologist	1	2
Medical Technician	1	3
Laboratory helper	1	4
Chemists	0	1
Plumbing Inspector	1	1
	9	38

When the board first had funds available to extend its services into local communities, it had limited trained personnel available to administer the program. During 1936 the board financed post graduate training for 26 nurses, and employed 35 field nurses. With this small group of public health nurses, interest in public health problems in local communities was stimulated, and early in 1938 the first full time county health unit was established. Since that time two other counties have established health units and several others are planning units in the near future.

The plan of the past three years, in which only nursing services were conducted in the counties, was necessary because of lack of trained health officers, as well as the lack of interest by local governments. The work of the nurses in the counties has, in most cases, made the citizens appreciate the value of health and made them understand their own health hazards.

The establishing of health units has brought supervision and consultation of medical problems into the nurses daily routine and has relieved the advisory personnel of the board from frequent and prolonged field trips throughout the state.

The State Board of Health is now offering advisory services to local governments by specially trained personnel through the following divisions:

Administration
Epidemiology
Crippled Children
Food and Drugs
Laboratories
Maternal and Child Health
Plumbing
Nursing
Sanitary Engineering
Tuberculosis
Vital Statistics

CHAPTER VI

FINANCIAL RESOURCES

COUNTIES

Each Colorado county has its own system of recording and classifying expenditures. Since all items are not classified the same in each county, it is impossible to show the portion of county funds spent on public health without a detailed audit in each county. Time will not permit such a study, and so the possibility of financing health work in the separate counties will be considered on the basis of the ability of the counties to raise funds for such work.

The assessed valuation of a community, from which taxes are collected, is best visualized on the per capita basis. When this is calculated on the basis of the 1938 estimated populations we see that 8 counties (see Table XIV) have an assessed per capita valuation over $2,000; 4 counties have from $1,600 to $2,000; 18 counties have from $1,200 to $1,600; 21 counties have $800 to $1,200 and 12 counties have less than $800. With the exception of Arapahoe County, all counties with a per capita assessed value under $800 are on the western slope. Five of these counties are in the San Luis valley, three in the San Juan valley, and three in the Colorado valley. The highest per capita assessed values are along the northern part of the Continental Divide and the central eastern plains area.

The bonded debt of the counties is an important factor to consider in determining the amount of money a county can reasonably spend on any activity. The per capita bonded debt of Colorado counties in 1937, based on the 1938 population estimates (see Table XIV) ranged from $2.61 in Lake County to $150.12 in Denver County. Large or small per capita debts do not seem to effect any particular group of counties, but a larger portion of the western slope counties have relatively lower per capita debt than those in the eastern portion of the state.

The per-cent of taxes collected in a county is an indication of the economic status of the community and must have full consideration in determining the ability of that community to support adequate public health protection. The five year (1932-1936) average tax collections of Colorado counties show (see Table XV) a range from 37.89 per-cent in Hinsdale County to 97.68 per cent in Jackson County. The highest per-cent of collections are made in the counties in the north-central part of the state and the poorest collections in the San Luis, San Juan and Colorado valleys.

Mustard (20) indicates that the present average per capita expenditures of approximately forty cents for public health in rural areas

TABLE XIV

ASSESSED VALUE AND BONDED DEBT - COLORADO COUNTIES, 1937

COUNTY	TOTAL ASSESSED VALUE	PER CAPITA ASSESSED VALUE	TOTAL BONDED DEBT	PER CAPITA BONDED DEBT
Adams	$ 23,479,854	$ 1,112.00	$ 1,018,050	$ 48.21
Alamosa	7,274,235	731.59	619,810	62.34
Arapahoe	18,578,329	687.04	1,241,150	45.89
Archuleta	3,070,661	1,036.69	104,300	35.21
Baca	10,281,771	1,473.88	408,160	58.51
Bent	10,684,621	1,343.97	193,700	24.36
Boulder	36,791,675	1,060.43	1,598,900	46.08
Chaffee	7,795,951	937.01	273,500	32.87
Cheyenne	8,289,368	3,039.74	222,000	81.41
Clear Creek	4,788,620	1,329.06	101,500	28.17
Conejos	6,864,010	645.96	366,990	34.54
Costilla	4,015,103	658.64	131,050	21.50
Crowley	5,564,268	974.14	524,900	91.89
Custer	2,248,140	934.39	34,500	14.34
Delta	10,626,243	727.73	576,690	39.49
Denver	394,279,483	1,320.82	44,812,500	150.12
Dolores	1,207,650	698.06	76,950	44.48
Douglas	7,704,528	2,121.87	122,700	33.79
Eagle	8,938,979	2,181.30	101,650	24.80
Elbert	9,961,386	1,871.39	100,300	18.84
El Paso	52,890,883	1,040.97	3,804,500	74.88
Fremont	14,977,141	822.20	1,335,200	73.30
Garfield	12,998,090	1,315.73	927,250	93.86
Gilpin	3,024,295	2,344.41	59,000	45.74
Grand	6,466,898	2,668.96	139,000	57.37
Gunnison	9,880,608	1,566.86	615,100	97.54
Hinsdale	556,784	1,089.59	16,500	32.28
Huerfano	9,878,606	569.50	722,000	40.95
Jackson	2,616,815	1,971.98	58,000	43.71
Jefferson	23,387,228	883.30	1,020,070	38.53
Kiowa	7,533,308	2,741.38	145,600	52.98
Kit Carson	10,802,456	1,444.37	605,000	80.89
Lake	7,650,610	1,534.11	13,000	2.61
La Plata	10,460,626	750.67	847,090	60.79
Larimer	36,463,062	1,085.18	3,722,500	110.79
Las Animas	28,953,297	806.45	2,120,500	59.24
Lincoln	10,211,474	1,891.01	284,750	52.73
Logan	22,352,347	1,254.06	1,227,500	68.87
Mesa	21,293,084	650.73	1,850,950	56.57
Mineral	1,215,514	1,836.12	8,000	12.08
Moffat	5,495,261	1,263.86	124,300	28.59
Montezuma	4,329,031	548.19	293,500	37.17
Montrose	8,553,039	633.42	441,600	32.70
Morgan	18,415,848	1,143.91	903,820	56.14
Otero	21,972,789	910.64	1,378,560	57.13
Ouray	2,994,949	1,412.05	95,100	44.84

TABLE XIV - Continued

ASSESSED VALUE AND BONDED DEBT - COLORADO COUNTIES, 1937

COUNTY	TOTAL ASSESSED VALUE	PER CAPITA ASSESSED VALUE	TOTAL BONDED DEBT	PER CAPITA BONDED DEBT
Park	$ 7,012,553	$ 2,676.55	$ 34,000	$ 12.98
Phillips	7,071,123	1,268.36	437,100	78.40
Pitkin	2,315,248	1,337.52	89,500	51.70
Prowers	14,719,906	1,333.45	1,080,050	97.84
Pueblo	58,486,040	995.22	4,257,900	72.45
Rio Blanco	3,830,863	1,332.47	296,000	102.96
Rio Grande	8,132,116	594.24	551,970	40.33
Routt	12,485,082	1,277.60	462,150	47.29
Saguache	6,825,402	1,085.46	151,200	24.05
San Juan	3,049,413	1,169.25	94,000	36.04
San Miguel	3,420,603	1,333.05	110,500	43.06
Sedgwick	7,625,995	1,599.08	563,000	118.05
Summit	3,700,657	3,592.87	64,000	62.14
Teller	5,118,815	1,099.64	118,900	25.54
Washington	10,351,720	1,328.68	295,000	37.86
Weld	68,061,829	1,091.91	2,733,290	43.76
Yuma	10,840,763	944.98	523,950	44.44

TABLE XV

POSSIBLE COUNTY REVENUES FOR LOCAL PUBLIC HEALTH PURPOSES, COLORADO, 1937

COUNTY	5 Yr. AVERAGE % TAX COLLECTION 1932-1936	ESTIMATED FUND AT 50¢ PER CAPITA	MILL LEVY REQUIRED FOR 50¢ PER CAPITA
Adams	85.92	$ 10,558	.5
Alamosa	69.81	5,971	1.2
Arapahoe	87.07	13,521	.8
Archuleta	88.17	1,481	.6
Baca	72.08	3,488	.5
Bent	87.33	4,975	.5
Boulder	93.28	18,348	.5
Chaffee	87.19	4,160	.6
Cheyenne	83.49	1,364	.2
Clear Creek	68.52	1,802	.6
Conejos	66.66	5,313	1.2
Costilla	43.40	3,048	1.8
Crowley	70.50	2,856	.7
Custer	84.52	1,203	.6
Delta	78.10	7,301	.9
Denver	95.17	149,256	.4
Dolores	52.90	865	1.4
Douglas	91.52	1,816	.3
Eagle	92.61	2,049	.3
Elbert	83.42	2,662	.3
El Paso	93.05	25,405	.5
Fremont	90.44	9,108	.7
Garfield	88.88	5,940	.5
Gilpin	65.06	645	.3
Grand	90.13	1,212	.2
Gunnison	80.75	3,153	.4
Hinsdale	37.89	256	1.2
Huerfano	79.07	8,815	1.1
Jackson	97.68	664	.3
Jefferson	89.77	13,239	.6
Kiowa	85.91	1,374	.2
Kit Carson	72.96	3,740	.5
Lake	74.14	2,494	.5
La Plata	85.52	6,968	.8
Larimer	90.58	16,800	.5
Las Animas	76.51	17,898	.8
Lincoln	69.59	2,700	.4
Logan	88.37	8,912	.5
Mesa	81.69	16,361	.9
Mineral	84.93	331	.3
Moffat	77.96	2,174	.5
Montezuma	60.27	3,949	1.5
Montrose	85.53	6,752	.9
Morgan	91.90	8,050	.5
Otero	89.66	12,065	.6
Ouray	78.06	1,061	.5

TABLE XV - Continued

POSSIBLE COUNTY REVENUES FOR LOCAL PUBLIC HEALTH PURPOSES, COLORADO, 1937

COUNTY	5 Yr. AVERAGE % TAX COLLECTION 1932-1936	ESTIMATED FUND AT 50¢ PER CAPITA	MILL LEVY REQUIRED FOR 50¢ PER CAPITA
Park	90.19	1,310	.2
Phillips	87.46	2,788	.5
Pitkin	75.76	866	.5
Prowers	84.19	6,420	.5
Pueblo	87.59	29,384	.4
Rio Blanco	79.44	1,438	.5
Rio Grande	74.59	6,843	1.1
Routt	84.81	5,386	.5
Saguache	82.46	3,144	.5
San Juan	61.45	1,304	.7
San Miguel	63.42	1,283	.6
Sedgwick	86.05	2,385	.4
Summit	69.86	515	.2
Teller	78.53	2,328	.6
Washington	84.30	3,896	.5
Weld	90.62	31,230	.5
Yuma	87.60	5,895	.6

is "distressingly low" and that "a quite satisfactory service may be operated for about one dollar per capita". On the basis of the present policy of the United States Public Health Service matching local expenditures for health activities each county supporting a full time health unit would have to raise fifty cents per capita. Only ten counties, exclusive of Denver, have a population over 20,000 persons which is the minimum population in which a full time health unit can operate on a practical basis. If the remaining 52 rural counties desire full time health service, it will be necessary for two or more adjacent counties to pool their resources and form district units.

To determine the mill levy necessary for Colorado counties to raise fifty cents per capita, the following formula was used:

$$\frac{\text{Desired Revenue (Table XV)}}{\text{Assessed Valuation (Table XIV) X Average \% Collection (Table XV)}} =$$

Necessary Mill Levy (Table XV)

Of the ten counties with a population great enough to support a full time health service, the necessary mill levies for a complete service would range from .4 mill in Pueblo County to .9 mill in Mesa County. Of the remaining 52 rural counties, only 8 would require a levy of more than one mill to raise fifty cents per capita.

A per capita expenditure of one dollar has been suggested here as a goal rather than a starting point for public health work in Colorado counties. It would probably be unwise policy to start full time health work with more than half of this amount, adding to the beginning expenditures as the public health personnel determine the need, by the conditions which they meet. In some areas the public health needs may be adequately cared for with less than the suggested goal, while in others, the needs may far exceed the expenditure of one dollar per capita.

The median county levy necessary to raise fifty cents per capita would be .57 mill on the basis of the 1937 assessments. Other median mill levies for 1937 in Colorado counties were as follows:

Welfare	1.18 mill
Roads & Bridges	1.62
General School	5.00
Ordinary	6.04

Thus it is seen that a very small increase in county levies would adequately provide a good local health service.

STATE

The Colorado state legislature at its biennial meeting sets a two year appropriation for the State Board of Health, the money coming from the state general fund. Other funds are collected by the Restaurant and Plumbing divisions for license fees and expended by them. The total state expenditures including collected fees, in the fiscal year 1938-1939 (see Table XVI) amounted to $138,408.44 and state, plus federal fund expenditures, amounted to $425,848.12. On a state per capita basis, state and federal expenditures were 40.70 cents of which 13.22 cents or 32.5 per-cent was of state origin. Epidemiology, Cancer, Pneumonia, Industrial Hygiene, Nursing Administration, Trainees, and County aid during this fiscal year were financed entirely by federal funds. If it were not for federal allotments, the Colorado State Board of Health would be able to do very little public health work.

Nursing administration includes principally, the state administration office expense. Advisory nursing services are maintained by the divisions of Maternal and Child Health, and Venereal Diseases, and field nursing services are paid out of Maternal and Child Health and Field Nursing items listed in Table XVI.

TABLE XVI

STATE AND FEDERAL HEALTH EXPENDITURES IN COLORADO, FISCAL YEAR 1938-39

SERVICE	STATE EXPENDITURES	STATE AND FEDERAL EXPENDITURES	STATE AND FEDERAL CENTS PER CAPITA
Administration	$ 8,300.55	$ 17,587.73	1.68
Maternal and Child Health	15,631.23	92,768.64	8.87
Crippled Children	46,084.35	124,390.58	11.89
Bacteriology	5,916.81	16,787.03	1.60
Vital Statistics	6,798.99	10,682.64	1.02
Venereal Disease	806.40	12,605.59	1.20
Sanitation	5,831.33	19,404.18	1.85
Epidemiology	--	8,709.29	0.83
Tuberculosis	772.62	6,691.21	0.64
Nursing Administration	--	9,272.40	0.89
Field Nursing Service	10,693.26	25,654.67	2.45
Food, Drug, and Restaurant	31,643.59	31,643.59	3.02
Trainees	--	18,834.36	1.80
Pneumonia	--	5,023.32	0.48
Plumbing	5,929.31	5,929.31	0.57
Industrial Hygiene	--	3,819.53	0.37
Cancer	--	2,225.35	0.21
County Aid	--	15,604.18	1.49
TOTAL	$ 138,408.44	$ 425,848.12	40.70

CHAPTER VII

SUMMARY AND RECOMMENDATIONS

In the four preceding chapters dealing with the physical characteristics, experiences, and health facilities of the 63 counties of Colorado, the most constant observation is the wide variation of of these factors among the counties. The problems considered tend to localize in certain areas that correspond generally to those suggested in the description of Colorado hospital facilities. This provides for seven districts, one metropolitan district including the City and County of Denver, and six rural districts corresponding in general to the river valleys within which transportation facilities are convenient. If the problems are considered on the basis of these districts, the populations (estimated 1938) for each range from 35,752 to 298,512 persons. In these larger population groups statistical data become more significant and errors of dealing with small numbers are lessened.

On the basis of district statistical studies (see Appendix) the main public health problems of the state are distributed as follows:

DENVER The death rate is high, especially for tuberculosis, but the birth and infant death rates are low. Hospital facilities and physicians' services are in general on a higher level than elsewhere in the state. Public health nursing per population is probably adequate and the area per nurse is very small, but only 15 per-cent of the nursing services are financed by official agencies. The assessed valuation is $1,320.82 and the bonded debt is $150.12 per capita. This is the highest per capita bonded debt in the state.

PLATTE DISTRICT The infant death rate, general death rate, and tuberculosis death rate are low. Hospital facilities, physicians' and public health nursing services are insufficient in proportion to the population. Approximately half of the nursing services are sponsored by official public health agencies, and half by the schools. The assessed valuation of this district is $1,119.30 and the bonded debt is $60.37 per capita.

EAST-CENTRAL DISTRICT The general death rate and tuberculosis death rate are high. The infant death rate is low. Seventy-four per-cent of the nursing personnel is sponsored by an official public health agency. The assessed valuation is $1,146.86 and the bonded debt is $54.69 per capita.

ARKANSAS DISTRICT The infant death rate and the pneumonia death rate are high. Physicians' services and hospital services are fairly well developed. Nursing services are more concentrated per

population than in any of the rural districts, but the area per nurse is large. Seventy per-cent of the nursing services are sponsored by an official public health agency. The assessed value is $968.29 and the bonded debt is $63.76 per capita.

SAN LUIS-SAN JUAN DISTRICT The birth rate, infant death rate, and pneumonia death rate are high, the pneumonia and infant death rates being the highest of all districts. Physicians' and public health nursing services are insufficient in proportion to population, and the area per nurse is large. Sixty per-cent of the nursing services are sponsored by an official public health agency. The assessed valuation is $750.82 and the bonded debt is $42.39 per capita.

COLORADO DISTRICT The birth, death, and pneumonia death rates are high. The distribution of nurses and physicians are low in proportion to population, and the area per nurse is large. This district has the lowest distribution of public health nursing per population with 57 per-cent of the services furnished by official public health agencies. The assessed value is $858.07 and the bonded debt $46.81 per capita.

WHITE-YAMPA DISTRICT The birth rate of this district is the highest in the state with general death and infant death rates close to the average for the state. Available hospital beds in proportion to population are the lowest in Colorado. Public health nursing per population is fairly well developed, but the area per nurse is the largest in the state. All public health nursing is sponsored by official agencies. The assessed value is $1,581.24 and the bonded debt is $60.76.

The above summary of the various districts of the state indicates some of the specific problems of these areas that should receive immediate attention. These problems are not simple enough to be solved by the citizens of the community, but require the careful analysis and planning of a trained administrator.

In Denver, the main problem is an attack on tuberculosis, and an analysis of the specific causes of the high death rate followed by a plan to reduce its causes. A lack of interest in the health of its citizens is suggested in the small portion of its nursing services now sponsored by its government. In spite of the large per capita debt, the assessed valuation is still capable of producing a revenue sufficient for better health protection.

In the Platte district vital statistics indicate a good state of health, but if this good record is to be maintained, more public health nursing service is recommended. The assessed value and bonded debt of this district would suggest an ability to increase nursing services by 50 to 100 per-cent.

In the East-Central District the health problem is almost identical with that of Denver. The problems of this district can be better supported by local governments, because with approximately the same per capita valuation as Denver, it is burdened with only about one third of the per capita bonded debt.

The Arkansas District presents a special problem in infant deaths and a high pneumonia death rate. The keen interest of the citizens of this district in the protection of their health is evidenced in the concentration of the nursing service. In spite of this effort to improve their health, there are many problems not yet attacked. While nursing services are in need of some increase it would probably be more practical to expend some of the available funds for the services of administrative personnel well trained in modern methods of appraisal and program planning.

The San Luis-San Juan District presents the greatest health problems of the state. Its birth, death, pneumonia death, and infant death rates are high. The nursing service should at least be doubled, and other public health personnel are badly needed. The assessed valuation is lower per capita than any of the other districts and little support for health work can be obtained from a tax levy. The local governments of this district are more in need of state and federal aid than in any other part of the state.

The Colorado District presents special problems of high birth, death, and infant death rates. These problems are being met with the poorest distribution of public health nursing in the state. If the nursing service of this area were increased to three times its present strength, it would still be hardly adequate to meet the public health problems with good nursing service. The assessed value of this area is low but the bonded debt is low, and some local funds could be raised by taxation to protect local health. The low assessed value of this district should have consideration in the distribution of state and federal allocations for local health work.

The White-Yampa District presents only the problem of a high birth rate. In this district it would appear that the nursing service per population is fair, but when we consider that each nurse has approximately six times as much area to cover as those in the Arkansas district and that hospital services are inadequate, then the high birth rate becomes a major problem, and a more concentrated nursing service in this district than in any of the others should be recommended.

The State Board of Health, since 1936, has been able to organize only two full time local health units because of the lack of trained medical personnel to organize and direct them. Lacking medical directors for local administration the policy was adopted of introducing public

health nursing services in the counties without full time medical supervision. Under such a system it has been necessary for nurses to assume all administrative activities. The result of this has been demonstrated in the previous discussion of Colorado public health nursing services.

It has been shown that Colorado public health nurses averaged 647 field visits per nurse per year. The author has reviewed field nurses' reports from health units directed by full time medical administrators from all parts of the United States and finds a range from 900 to over 1900 field visits per nurse, per year, averaging about 1400. This would indicate that nurses without medical supervision could double their field visits if they could be relieved of administrative duties, for which they are not specially trained.

In a preceding chapter it was pointed out that neither population nor area can be practically used as a measure of required personnel to meet the public health needs of a community. A good picture of health service requirements can be obtained only by an analysis of community experience in morbidity, natality, and mortality, plus a consideration of available facilities and the ability of the citizens to pay for needed services. It is readily seen that each locality will require different types and quantities of health services and the final answer can be obtained only by careful local appraisals.

As an estimated comparison of what portion of the state's health needs are being met at the present time, the author has selected natality. In selecting this single factor it is evident that the use of other factors may increase or decrease the estimates, but a complete appraisal is beyond the scope of this study and the example is presented as a method of approach rather than a conclusive fact.

Within the state, in 1938, there were recorded 20,958 live births and stillbirths of which approximately 50 percent occurred in hospitals and maternity homes. If we expect public health nurses to average four visits per home confinement, then there should have been 41,916 home maternity visits. In a preceding chapter it was shown that 47 Colorado public health nurses averaged 137.3 maternity visits per year working outside an organized health unit. On this basis it would have required the services of 305 nurses to make the expected number of home visits, and we see (see Table VIII) that there were 72 nurses employed by official agencies during this period. Some consideration must also be given to nursing service furnished by voluntary agencies and schools. These, however, are hard to measure in the generally accepted definition of public health because the nurses of voluntary agencies devote a large part of their time to bedside nursing recognized as an essential community health function but only rarely carried as a major activity of a health department at present. School nurses are often expected to do truancy and other work not considered as health measures.

It has also been shown that field visits can be materially increased if nurses can be relieved of administrative duties. On this assumption Colorado nursing needs could be met on a minimum basis with 153 field nurses if they were under the supervision of trained public health executives.

The nursing personnel represents the front line troops of the public health army. It is they who actually deliver health services to the consumers, and make most of the direct contacts with the citizens who are served. Since their work is easier measured and because they are in the most direct contact with the community, the author has, in previous discussions, measured health services on the basis of nursing facilities.

On the basis of foregoing discussions, it would seem most practical at the outset to extend the organized health services of Colorado by adding local full time trained medical health administrators rather than increasing nursing personnel. Medical officers assigned to local areas would have the advantage of close contact with local problems, and would be able to appraise and recommend health programs far better than a representative of the state office making short, periodic visits. Any local area requiring the services of six nurses with no full time health officer should be able to produce the same or more health work at approximately the same cost by replacing three nurses with a health officer and sanitarian to form a health unit capable of offering a wider and more complete service.

The more complete and wider variety of health service that can be offered by an organized health unit at approximately the same cost leads the author to recommend that the future policy of the State Board of Health be directed toward the establishment of full time health unit service for the entire state.

Ten, or possibly 12 of the Colorado rural counties have a population and taxable wealth within which it would be practical to operate a full time health unit. In some of these it would be of mutual advantage to join with one or more adjacent counties in the interests of economy in operation. All other counties would find it necessary for several adjacent counties to form an administrative district if they are to receive complete, full time health service.

The author had planned on presenting a plan of local full time health administration in which all counties of the state would be grouped into districts on the basis of proximity, transportation facilities, assessed valuation, bonded debt and other factors. Field experience has shown that such well laid plans are of little value.

The deep rooted and fixed lack of confidence of one county group in another, or the staid resolve not to cooperate with neighbors even though it be for mutual benefit, will often require redistribution of counties within the proposed districts. For these reasons the author will leave to the organizer of local health administration the proposal of which counties shall be included in the various districts after he has learned the wishes of the counties through personal contact.

It is hoped that the studies here presented will be used to show the citizens of Colorado some of the health problems of the state and will stimulate their desire to attack these problems with full time health services in all parts of the state.

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APPENDIX

COLORADO DISTRICTS

DISTRICT	DENVER	PLATTE	EAST-CENTRAL	ARKANSAS	SAN LUIS-SAN JUAN	COLORADO	WHITE-YAMPA
COUNTIES	Denver	Adams Boulder Larimer Logan Morgan Phillips Sedgwick Washington Weld Yuma	Arapahoe Cheyenne Clear Creek Douglas Elbert El Paso Gilpin Jefferson Kit Carson Lincoln Park Teller	Baca Bent Crowley Custer Fremont Huerfano Kiowa Las Animas Otero Prowers Pueblo	Alamosa Archuleta Conejos Costilla Dolores Hinsdale La Plata Mineral Montezuma Rio Grande Saguache San Juan	Chaffee Delta Gunnison Lake Mesa Montrose Ouray Pitkin San Miguel	Eagle Garfield Grand Jackson Moffat Rio Blanco Routt Summit
Number of Counties	1	10	12	11	12	9	8
Population, 1930	287,861	223,746	134,963	208,704	68,800	76,144	35,573
Population, 1938	298,512	215,719	141,055	191,368	76,943	86,858	35,752
Per-cent of State Population, 1930	27.79	21.59	13.05	20.14	6.63	7.33	3.43
Per-cent Population Gain, 1930-1938	3.7	- 3.6	4.5	- 8.3	11.8	14.1	--

DISTRICT	DENVER	PLATTE	EAST-CENTRAL	ARKANSAS	SAN LUIS SAN JUAN	COLORADO	WHITE-YAMPA
Area, Square Miles	58	17,892	16,290	20,617	15,637	14,100	19,064
Population Density Per Square Mile, 1930	5,147	12	9	9	5	6	2
Number of Towns Under 1,000 Population, 1930	0	43	32	24	21	20	18
Number of Towns 1,000 - 2,500 Population, 1930	0	13	10	6	4	3	6
Number of Towns 2,500 - 10,000 Population, 1930	0	5	1	6	3	4	0
Number of Cities 10,000 - 50,000 Population, 1930	0	3	1	1	0	1	0
Number of Cities over 50,000 Population, 1930	1	0	0	1	0	0	0
Per-cent Males, 1930	48.6	52.0	51.1	52.2	53.0	52.8	55.9
Per-cent Females, 15-44 Years, 1930	25.9	21.8	22.3	22.3	21.4	21.2	20.6

DISTRICT	DENVER	PLATTE	EAST-CENTRAL	ARKANSAS	SAN LUIS-SAN JUAN	COLORADO	WHITE-YAM
Per-cent Native Born White, 1930	84.0	83.3	90.8	80.9	85.8	86.0	88.8
Per-cent Foreign Born White, 1930	10.9	8.4	7.0	7.3	3.5	7.5	7.4
Number of Mexicans, 1930	6,837	16,448	1,467	21,137	6,067	4,637	1,083
Per-cent Mexican, 1930	2.4	7.4	10.9	10.1	8.8	6.1	3.0
Number Under 5 Years Age, 1930	20,113	23,004	11,395	21,987	8,529	7,341	3,301
Per-cent Under 5 Years Age, 1930	7.0	10.3	8.4	10.5	12.3	9.6	9.3
Number Over 65 Years Age, 1930	19,884	11,756	9,403	10,302	3,273	5,096	2,073
Per-cent over 65 Years Age, 1930	6.9	4.9	7.0	4.9	4.8	6.5	5.8
Number of General Hospitals, 1938	11	14	8	9	10	12	5

DISTRICT	DENVER	PLATTE	EAST-CENTRAL	ARKANSAS	SAN LUIS-SAN JUAN	COLORADO	WHITE-YAMPA
Number of General Hospital Beds, 1938	2,120	535	453	691	279	330	69
General Hospital Beds Per 1,000 Population, 1938	7.1	2.5	3.2	3.6	3.6	3.8	1.9
Median Number of Beds Per General Hospital, 1938	160	32	20	50	27	18	11
Number of Recorded Births in Registered Hospitals, 1938	4,749	1,206	952	1,246	554	549	163
Per-cent of Recorded Births in Registered Hospitals, 1938	91.6	28.3	50.8	32.8	31.4	29.6	21.2
Number of Physicians, 1938	748	231	192	194	70	86	41
Population Per Physician, 1938	399	934	735	986	1,099	1,010	872
Official Public Health Nurses, 1938	12	11	14	21	5	4	5
Voluntary Public Health Nurses, 1938	49	0	5	4	0	0	0

DISTRICT	DENVER	PLATTE	EAST-CENTRAL	ARKANSAS	SAN LUIS-SAN JUAN	COLORADO	WHITE-YAMPA
School Nurses, 1938	19	9	0	5	3	3	0
Total Public Health Nurses, 1938	80	20	19	30	8	7	5
Population Per Public Health Nurse, 1938	3,731	10,786	7,424	6,379	9,618	12,408	7,150
Square Miles Per Public Health Nurse, 1938	.73	895	857	687	1,955	2,014	3,813
Residence Allocated Births, 1938	5,299	4,421	2,456	3,803	1,776	1,862	833
Residence Allocated Birth Rate, 1938	17.8	20.5	17.4	19.9	23.1	21.4	23.3
Fertility Rate, 1930	27.0	47.2	37.8	43.3	58.0	45.5	45.1
Residence Allocated Infant Deaths, 1938	263	221	122	281	183	126	47
Residence Allocated Infant Death Rate, 1938	49.6	50.0	49.7	73.9	103.0	67.7	56.4

DISTRICT	DENVER	PLATTE	EAST-CENTRAL	ARKANSAS	SAN LUIS-SAN JUAN	COLORADO	WHITE-YAMPA
Residence Allocated Deaths, 1938	3,856	2,117	1,662	2,077	868	1,019	369
Residence Allocated Death Rate, 1938	12.9	9.8	11.8	10.9	11.3	11.7	10.3
Residence Allocated Pneumonia Deaths, 1938	281	179	122	197	142	116	22
Residence Allocated Pneumonia Death Rates, 1938	94.1	83.0	86.5	102.9	184.6	133.6	61.5
Residence Allocated Tuberculosis Deaths, 1938	213	62	102	97	24	20	6
Residence Allocated Tuberculosis Death Rates, 1938	71.4	28.7	72.3	50.7	31.2	23.0	16.8

DISTRICT	DENVER	PLATTE	EAST-CENTRAL	ARKANSAS	SAN LUIS-SAN JUAN	COLORADO	WHITE-YAMPA
Total Assessed Value, 1937	$ 394,279,483	$ 241,454,217	$ 161,769,935	$ 185,299,887	$ 57,000,545	$ 74,530,335	$ 56,532,645
Per Capita Assessed Value, 1937	$ 1,320.82	$ 1,119.30	$ 1,146.86	$ 968.29	$ 740.82	$ 858.07	$ 1,581.24
Total Bonded Debt, 1937	$ 44,812,500	$ 13,023,110	$ 7,713,870	$ 12,201,070	$ 3,261,360	$ 4,065,940	$ 2,172,350
Per Capita Bonded Debt, 1937	$ 150.12	$ 60.37	$ 54.69	$ 63.76	$ 42.39	$ 46.81	$ 60.76

(State Multigraphing Department)